MP MASTER
MA32852

QUILL®

Round Ring Binders

1"   11" x 8 ½" Sheet Size

Black	7-39301	Grey	7-39305
Dk. Blue	7-39302	Burgundy	7-39306
Royal Blue	7-39303	Green	7-39307
Red	7-39304	White	7-39313

ANDO

AQ－6315A／B
OPTICAL SPECTRUM ANALYZER
INSTRUCTION MANUAL

ANDO ELECTRIC CO.,LTD.

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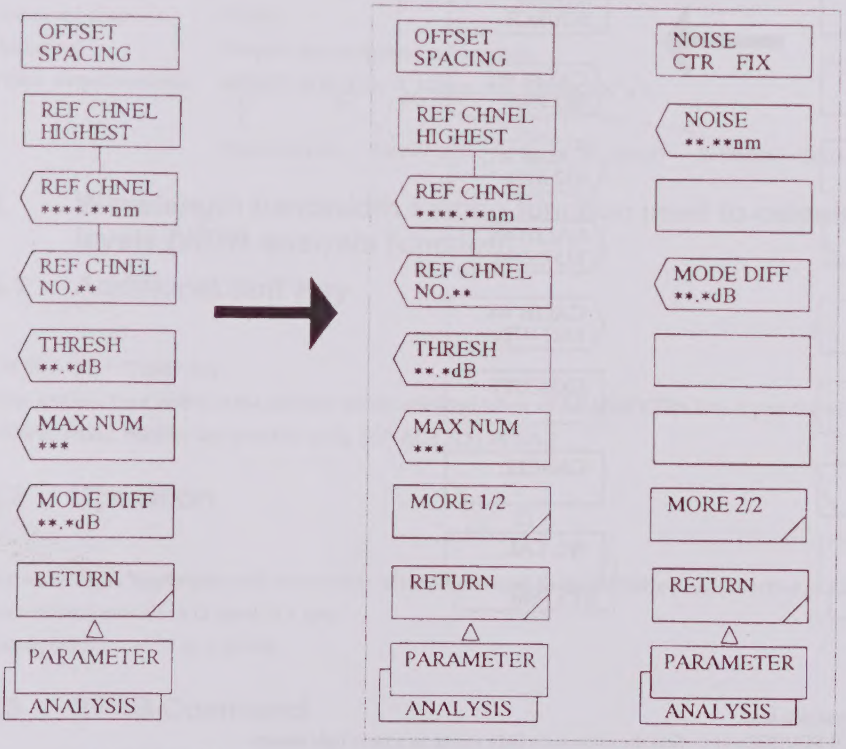
GUIDE TO THE ADDITIONAL FUNCTIONS

In the AQ-6315A/B containing the software version R06.11(M), R04.10(O) or later, the NOISE POINT FIXED function (WDM ANALYSIS), calibration function using the AQ6009 Wavelength Reference Light Source have been added. The GP-IB function have been modified. In the AQ-6315A/B containing the software version R06.14(M), R04.11(O) or later, the wavelength bandwidth setting function used to calculate noise levels (WDM ANALYSIS) and masking method selecting function (NOISE MASK) have been added. Accordingly, a part of the descriptions of the instruction manual has been changed. Replace the relevant pages with those contained herein.

1. NOISE POINT FIXED Function

1.1 Changing the Soft Keys

※ Soft key menu when the <PARAMETER> key is pressed using the [ANALYSIS] switch during the selection of the <ANALYSIS2 WDM> key



Additional soft keys

<NOISE CTR FIX> key: Specifies noise measuring points.

When CTR is selected: Center between the channels
When FIX is selected: Point specified using the <NOISE **. ** nm> key

<NOISE **. **nm> key: Specifies measuring points when FIX is specified.

**. **: 0.00 to 10.00 nm
※ Valid only when FIX is selected using the <NOISE CTR FIX> key

1.2 Adding the GP-IB Commands

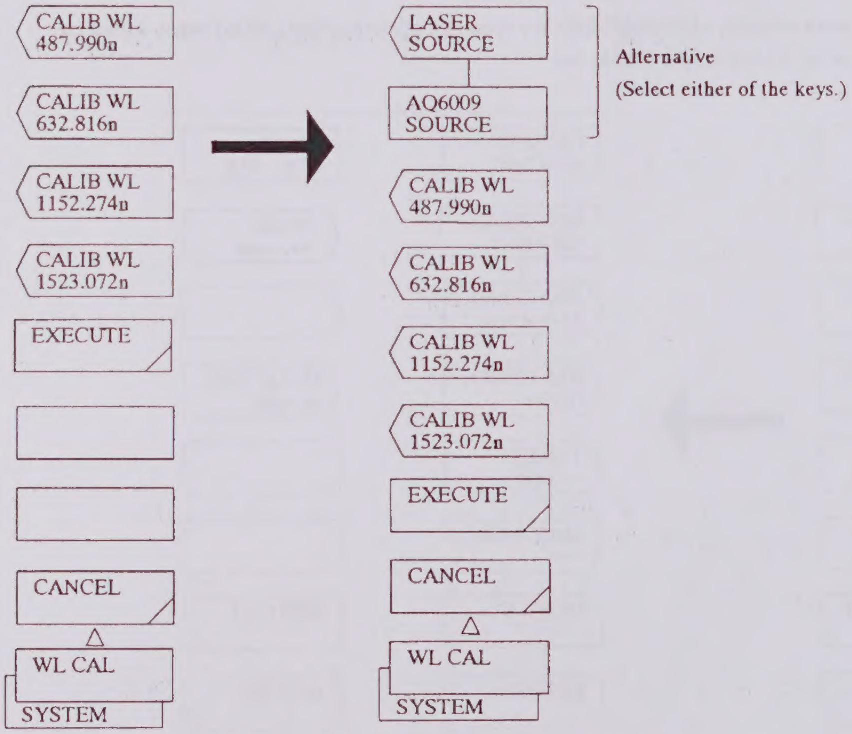
(1) WDMNOI* → Selects noise measuring points.
When CTR *: 0
When FIX *: 1

(2) WDMNOIP**. ** → Specifies measuring points when FIX is selected.
**. **: 0.00 to 10.00 nm

2. Calibration Function Using the AQ6009 Wavelength Reference Light Source

2.2 Changing the Soft Keys

※ Soft key menu when the <WL CAL> key is pressed using the [SYSTEM] switch



Additional soft keys

<LASER SOURCE> key: Sets the calibration light source as a laser light source.
(Press this key to perform calibration using the laser light source such as an He-Ne light source.)

<AQ6009 SOURCE> key: Sets the calibration light source for the AQ6009 Wavelength Reference Light Source.
(Press this key to perform calibration using the AQ6009 Wavelength Reference Light Source.)

3. Changing the GP-IB Function

3.1 Device Clear Function

Formerly, although the same initialization as the POWER ON reset was performed when DCL and SDC were received, changes are made to perform the following operations.

- Clears the receiving buffer.
- Clears the output queue (talker data).

3.2 Adding the Hardware Initialization Command

Command name: *RST

Operation: Performs the same initialization as the POWER ON reset.

3.3 Adding the Equipment Information Output Request Command

Command name: *IDN?

Operation: Outputs the equipment information.

Talker output contents: ANDO, AQ6315x, 0, MRxx. xx ORxx.xx $^{C}_{R}{}^{L}_{F}$

Manufacturer Device name Serial No. (zero) Software version

4. Wavelength bandwidth setting function used to calculate noise levels (WDM analysis function)

4.1 Additional Soft Key

<NOISE BW*.**nm> key

(This key has been added to the soft key menu activated when <PARAMETER> key is pressed with <ANALYSIS2 WDM> key selected using [ANALYSIS] switch.)

4.2 Operation

The wavelength bandwidth used to calculate noise levels is set in the WDM analysis function. (In our conventional models, it is fixed to 1 nm)

Setting range: 0.01 to 1.00 nm

4.3 GP-IB Command

WDMNOIBW**** (****:0.01~1.00)

WDMNOIBW? → Talker command

4.4 Program Command

Soft key list	WDMNOISE BW*.**nm
Program area	WDM NOISE BANDWIDTH*.**nm

4.5 Display Change

In the WDM ANALYSIS result list, NOISE (/nm) display has been changed to NOISE (/BW).

5. Masking method selecting function in NOISE MASK

5.1 Additional Soft Key

<MASK LINE VERT HRZN> key

(This key has been added to the soft key menu activated when [DISPLAY] switch is pressed.)

※ Either VERT or HRZN is displayed in reverse video. (This key functions as an alternate key)

5.2 Operation

When VERT selected, values less than the mask value are set to 0s. Peak Search, Analysis and Inter-Trace Computation uses the data with the values less than the mask set to 0s as with the conventional NOISE MASK function.

When HRZN selected, values less than the mask value are used as the mask value. Peak Search, Analysis [illegible] Inter-Trace Computation uses the data with the values less than the mask set as the mask value.

5.3 GP-IB Commands

MSKL0 · · · · · Set to VERT.
MSKL1 · · · · · Set to HRZN.
MSKL? · · · · · Talker command

5.4 Program Commands

MASK LINE VERTICAL
MASK LINE HORIZONTAL

WARRANTY

ANDO ELECTRIC' products are shipped after they undergo severe inspection by the ANDO's Quality Assurance System. However, in case any failure due to a manufacturing fault or an accident occurring during transportation occurs, please contact our Service Department, Head Office Sales Department, or your nearest branch or business office.

The term of warranty is one year after the date of delivery. We are making repairs free of charge on failures that occur within this term. However, a failure due to the user's misoperation or modification or change, or a failure or damage due to a natural disaster is excepted from the said free repair service even if it occurs within the term.

MEANINGS AND USAGE OF MENTIONED MATTERS

This manual uses the following hazard identification markings that the operators and service personnel must be aware of all hazards associated with this system.

1. DANGER, CAUTION, NOTE, FOOTNOTE

(1) Degree of Importance of Information

The degree of importance of each information conforms to the order of DANGER > CAUTION > NOTE > FOOTNOTE on the basis of the meanings of them shown in (2).

(2) Meanings of hazard information

DANGER : This corresponds to a danger that may directly affect people's lives and is the special information to be most emphasized.

CAUTION : This is a possibility that the equipment may be damaged and gives advice on the possibility that the equipment operation may be interrupted.

NOTE : This is a supplementary explanation about "exception", "correction" or "limitation" of the text and is information other than DANGER, WARNING, CAUTION and FOOTNOTE.

FOOTNOTE : This is a note of reference to be placed below the text on a same page in supplementary explanation about terminologies used in this manual.
It is so arranged to be referenced by a combination of a "(NOTE)" and number.

2. Reference Guide

This guide indicated items to be referenced. References are shown by arrow, item number and item name as "→ 2.1.2 Operation checks".

3. Representation of Operating keys in the Text

Operating keys are represented as follows:

[ ] : Denotes a panel switch.
< > : Denotes a soft key.

PREFACE

This Manual describes the operating procedures and maintenance of the AQ-6315A/B Optical Spectrum Analyzer.

When you desire to know the features and functions of this equipment, read through this manual starting from Chapter 1.

The user who is operating this equipment for the first time, be sure to read Chapter 2 "Preparations before Use".

Regarding the operating procedures of this equipment, its functions are described in Chapter 4 "Usage" and Chapter 5 "Details of Functions" and they are concretely described in Chapter 8 "Examples of Measurement" including case study.

Periodic inspection of the equipment is indispensable for maintaining it in the normal condition.
Please refer to Chapter 11 "Maintenance" that describes mechanical inspection and operation check methods.

To know the principle of operation, refer to Chapter 10 "Principle and Circuit Configuration".

This Manual is described on a basis of an easy-to-understand organization, using concrete applications and illustrations for the explanation of operating procedures.

We wish you to make the most of the functions of this equipment obtaining its full performance.

PRECAUTIONS

- Lithium batteries are used in the memory of this analyzer and the backup circuit of the clock.
- Because the analyzer may malfunction when the lives of the batteries come to an end even if it can be used normally, replace the batteries after the lapse of about 7 years.
- A replacement of batteries needs to be taken by ANDO ELECTRIC.
  Since a repair goods need to be collected by us or to be shipped to us, please contact to ANDO headquarter, branch office, sales office or local agency.

Precautions for Safety

○ Before using this equipment, be sure to read through the "Precautions for Safety" and operation manual to ensure its correct operation.

○ After reading these documents, keep them handy so that anyone can read them at any time.

1. Restrictions on Using Environment

- Be careful in that no water mixes in this equipment to be free from getting wet. Otherwise, it can cause a fire, electric shock or fault.
- When this equipment is used in a dampen place, be sure to connect it to the earth.

2. Restrictions on Using Conditions

- Do not use this equipment beyond the specified supply voltage. Otherwise, it causes a fire, electric shock or fault.
- When this equipment is connected to a commercial power supply, connect it directly to an exclusive plug socket without fail. Do not use any extension cord, since it fears to cause a risk of heating or igniting.

3 Setup and Installation

3.1 Cautions to Personnel who Sets Up and Installs this Equipment

- Do not put many loads on one electrical outlet to avoid causing a fire or heating.
- Be sure to insert a power plug into its socket surely. If a metal piece or the like touches to the blade of the power plug socket, it causes a fire or electric shock.
- When the equipment is installed on a product with caster (dolley, etc.), be sure to lock the caster. If the product moves or falls down, it can cause a physical injury.

3.2 Restrictions or Prohibitions in Installing Environment and Conditions

- Do not place this equipment at a place where is fairly damp or dusty. Otherwise, it can cause an electric shock or fault.
- Do not put this equipment in a unstable place such as a shaky table or inclined location to avoid it falling down or bringing down. If does, it can cause aphysical injury.
- Do not put this equipment at a place where is subject to vibration or shock. If it falls down or brings down, it can cause a physical injury.
- Do not insert or drop a metal piece, etc., into the equipment interior from its opening section. If does, it can cause a fire, electric shock or fault.
- Do not put a power cord close an electric heater. If does, the cord coating might melt, causing a fire or electric shock in some cases.

- When pulling out a power plug, be sure to do it by holding the plug. If the power cord is pulled, it damages the cord and can cause a fire or electric shock.
- Do not insert or pull out a power plug with wet hands. If does, it can cause an electric shock.
- Do not place this equipment at a place where is exposed to the direct sunlight or where is high in temperature. If does, the internal temperature raises and it can cause a fire in some cases.

3.3 Prohibited Items in Equipment Installing Methods

- When moving this equipment, first pull out the power plug from its socket, and after making sure that its external connecting cords have been all removed, move the equipment. Otherwise, it can damage the cord and cause a fire or electric shock.
- Do not block the air hole of this equipment. Blocking it can cause a heat to be accumulated inside of the equipment, causing a fire in some cases.
- Do not damage, break down or rework a power cord. If a heavy article is put on the power cord, or if the cord is heated or pulled, the power cord is damaged, causing a fire or electric shock.

4 Preparations before Use

- Read through the operation manual (Chapter 2) carefully.

5 Using Methods

- Use this equipment following the procedures given in the operation manual.
- When a warning mark ([NOTE], [WARNING] or [DANGER]) is indicated, use this equipment following the instructions given in the operation manual.
- Do not put any container filled with water, etc., or a small metal piece on or near this equipment. If the water overflows or gets in this equipment, it can cause a fire, electric shock or fault.
- Do not rework, bend, twist or pull a power cord forcibly. If does, it can cause a fire or electric shock.
- Do not disassemble or remodel this equipment. If does, it can cause a fire, electric shock or fault.
- When this equipment is not used for a long period of time, be sure to keep the plug socket removed. If not, it can cause a fire, electric shock or fault due to a lightning.
- When the lid of printer is closed for replacement of recording paper, etc., be careful not to pinch or hurt one's finger. Also, attention be paid to the cutter section of printer.
- AQ-6315B needs to be handle with care because high power light may be emitted occasionally from [OPTICAL OUTPUT] when high power of light is connected to [OPTICAL INPUT].

6 Maintenance and Inspection

- It is recommended to conduct a periodical maintenance and inspection for this equipment.
  If this equipment is left for a long period of time without cleaning it with dust accumulated inside, it can cause a fire or fault in some cases. If you have any consultations in this respect, please contact the closest agent of our company listed at the end of the operation manual.

7 Remedial Actions Taken when Any Error Occurs

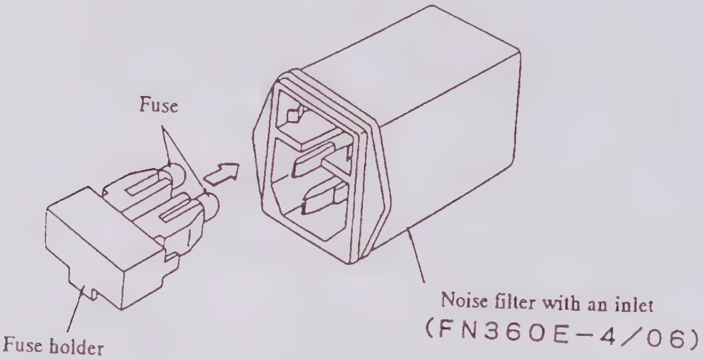
- When the power cord is damaged, ask our agent to replace it. If a damaged cord is used as it is, it can cause a fire or electric shock.
- When a foreign matter mixes into this equipment, first turn off the power switch of its main unit, pull out the power plug from its socket, and then contact our agent. If the defective equipment is used as it is, it can cause a fire, electric shock or fault.
- When this equipment is used under any abnormal conditions, e.g., giving out smoke or offensive smell, it can cause a fire, electric shock or fault. In such a case, turn off its power switch immediately and then pull out the power plug from its socket, and after making sure that no smoke is given out any more, ask our agent to repair the equipment. Do not repair it by the user himself to avoid any danger from occurring.
- If this equipment is dropped down or damaged, turn off the power switch of the main unit of this equipment, pull out the power plug from its socket, and then contact our agent. If the defective equipment is used as it is, it can cause a fire, electric shock or fault.
- If the fan motor of this equipment is over-heated, turn off the power switch of the main unit, pull out the power plug from its socket, and then contact our agent. If the motor is used as it is, it can cause a fire, electric shock or fault.
- A repair of this product needs to be taken by ANDO ELECTRIC in case that the above mentioned malfunction or other trouble is taken place.

  Since a repair goods need to be collected by us or to be shipped to us, please contact to ANDO headquarter, branch office, sales office or local agency.

PRECAUTIONS ON MOUNTING FUSES

When mounting fuses again after you have removed the fuse holder for replacing or checking a fuse, make sure to push in the holder until height of its face becomes even with that of the filter body (see the figures below). While you are inserting a fuse holder, you will feel a click from this noise filter equipped (with an inlet) used on this equipment. This noise filter is supplied from Schaffner Co., Ltd. Note, however, that this feeling can differ among the filters.

If you stop the insertion when you felt this click, an incomplete electric contact or no electric contact will result, potentially resulting in blowing the fuse. Thus, reasonable care must be exercised in this operation.



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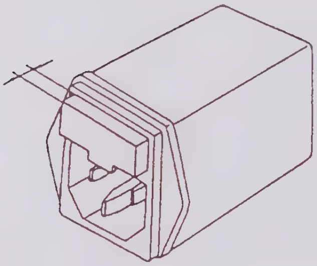

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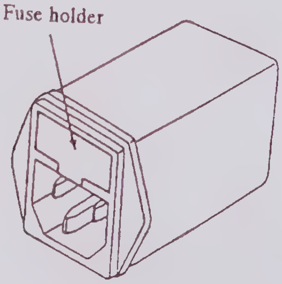


Push in the fuse holder in such that height its surface becomes even with that of the filter body.

CONTENTS

Chapter 1 GENERAL 1-1

1.1 Outline of Equipment 1-2
1.2 Specifications 1-2
1.3 Options 1-2
1.4 Configuration 1-2
1.5 Precautions on Handling 1-7
  1.5.1 Operating temperature range 1-7
  1.5.2 Environmental conditions 1-7

Chapter 2 PREPARATIONS BEFORE USE 2-1

2.1 Unpacking and Acceptance Inspection 2-2
  2.1.1 Mechanical checks 2-2
  2.1.2 Operation checks 2-2
2.2 Action to Be Taken upon Detection of Damage or Abnormality 2-2
2.3 Preparations and General Precautions 2-3
2.4 Safety Measures for Power Supply 2-4
  2.4.1 Protective earthing 2-4
2.5 Precautions in Use 2-5
2.6 Precautions on Storage 2-6
  2.6.1 Precautions before storage 2-6
  2.6.2 Recommendable storage conditions 2-6
2.7 Repacking and Transportation 2-7
  2.7.1 Repacking 2-7
  2.7.2 Transportation 2-7

Chapter 3 DESCRIPTION OF FUNCTIONS 3-1

3.1 Names and Functions of Panels 3-2
3.2 Software Functions 3-5

Chapter 4 USAGE 4-1

4.1 Preparations and Operation Checks 4-2
    4.1.1 Preparations before powering ON 4-2
    4.1.2 Connections to other units 4-2
    4.1.3 Power ON and screen display 4-3
    4.1.4 Stop procedure 4-4
4.2 Operations...4-5
    4.2.1 Description of screen 4-5
    4.2.2 Description of means for entering parameters..........................4-6
    4.2.3 Soft key execute form...4-8
    4.2.4 "WARNING" display 4-8

Chapter 5 DETAILS OF FUNCTIONS...5-1

5.1 Detailed Description of [FUNCTION] Section....................................5-3
    5.1.1 [SWEEP] switch 5-3
    5.1.2 [CENTER] switch...5-6
    5.1.3 [SPAN] switch...5-10
    5.1.4 [LEVEL] switch 5-12
    5.1.5 [SETUP] switch..5-19
    5.1.6 [MARKER] switch 5-23
    5.1.7 [PEAK SEARCH] switch 5-27
    5.1.8 [ANALYSIS] switch 5-30
    5.1.9 [TRACE] switch 5-51
    5.1.10 [DISPLAY] switch 5-63
    5.1.11 [MEMORY] switch 5-72
    5.1.12 [FLOPPY] switch 5-78
    5.1.13 [PROGRAM] switch 5-97
    5.1.14 [SYSTEM] switch...5-105
    5.1.15 [ADVANCE] switch 5-122
    5.1.16 [USER] switch...5-126
    5.1.17 [HELP] switch 5-126
    5.1.18 [COPY] switch 5-126
    5.1.19 [FEED] switch...5-132
    5.1.20 [AUXILIARY] switch 5-132
5.2 Detailed Description of Measuring Functions 5-133
    5.2.1 Pulse light measuring function 5-133
    5.2.2 External chop function 5-135

5.2.3 Power meter function 5-136
5.2.4 Optical output function (AQ-6315B only) 5-136
5.2.5 Analog output function 5-137
5.2.6 Power density display function 5-137
5.3 Detailed Description of Analysis Function 5-139
5.3.1 NF measuring function 5-139
5.3.2 Curve fit function 5-142
5.3.3 WDM analysis function 5-143
5.4 Spectrum Width data calculation Algorithm 5-145
5.4.1 Envelope method 5-145
5.4.2 Threshold method 5-147
5.4.3 RMS (effective value) method 5-148
5.4.4 Notch width measurement methods 5-149
5.5 Video Output Specifications 5-150
5.6 Nonvolatile Data Initialize Function 5-151
5.7 Wavelength Calibrate Function 5-152
5.8 Setting Clock 5-152
5.9 WARNING Display Function 5-152

Chapter 6 PROGRAM FUNCTION 6-1

6.1 Outline 6-2
6.2 Program Input 6-3
6.2.1 Program name input and change 6-4
6.2.2 Program input and change 6-5
6.2.3 Registered command parameter section change 6-9
6.2.4 Line insertion and deletion and program list print 6-9
6.3 Program Copy 6-11
6.4 Program Deletion 6-12
6.5 Program Execution 6-13
6.5.1 Executable program selection 6-13
6.5.2 Program execution 6-14
6.5.3 Program pause 6-15
6.5.4 Program execute error 6-15
6.6 Description of Commands 6-18
6.6.1 Description of variables 6-18
6.6.2 Rule of four operations by variables 6-20
6.6.3 Specifications of "@=VAL (A$)" command 6-20
6.7 Program Examples 6-46

Chapter 7 FLOPPY DISK FUNCTIONS 7-1

7.1 Floppy Disk Functions 7-2

7.1.1 Outline....................7-2

7.1.2 Loading/Unloading a floppy disk 7-3

7.2 Storing into a Floppy Disk....................7-4

7.3 Reading from a Floppy Disk 7-10

7.4 File List Display 7-15

7.5 File Deletion 7-16

7.6 Floppy Disk Initialization....................7-17

7.7 File Formats 7-19

7.7.1 Waveforms files 7-19

7.7.2 Data files 7-24

7.8 Data Compatibility with AQ-6312A/B Optical Spectrum Analyzer....................7-28

Chapter 8 MEASUREMENT EXAMPLES 8-1

8.1 Basic Measurement....................8-2

8.1.1 Measurement by the [SWEEP] switch, <AUTO>key 8-2

8.1.2 Measurement by manual operations 8-4

8.1.3 Measuring sensitivity selection....................8-6

8.1.4 Averaging times selection....................8-8

8.2 Applied Measurement....................8-9

8.2.1 Spectral width measurement....................8-9

8.2.2 SMSR measurement 8-11

8.2.3 Loss wavelength characteristic measurement 8-13

8.2.4 Optical filter transmission factor measurement 8-18

8.3 Usage of Markers 8-21

8.3.1 Marker names....................8-21

8.3.2 ▽ marker....................8-21

8.3.3 Wavelength line marker....................8-23

8.3.4 Level line marker....................8-24

8.3.5 Auto search 8-25

8.3.6 Wavelength difference and level difference measurement....................8-26

8.4 Convenient Functions....................8-27

8.4.1 Marker-to-marker sweep function....................8-27

8.4.2 Marker-to-marker power measurement function....................8-29

8.4.3 0 nm sweep function....................8-30

8.4.4 Normalization display function 8-32

8.4.5 Dominant display function....8-33
8.4.6 Three-dimensional display function....8-35

Chapter 9 GP-IB FUNCTIONS....9-1

9.1 GP-IB 1 Port and GP-IB 2 Port....9-2
9.2 Usage of GP-IB 1 Port....9-3
9.2.1 Interface functions of GP-IB 1 port....9-3
9.2.2 Connection to GP-IB system....9-3
9.2.3 Address setting....9-4
9.2.4 Local/remote function....9-4
9.2.5 Program codes (commands)....9-4
9.2.6 Output data....9-36
9.2.7 Service request function....9-48
9.2.8 Precautions on programming....9-50
9.2.9 Program code compatibility with AQ-6312A/B....9-51
9.2.10 Programming examples....9-52
9.3 Usage of GP-IB 2 Port....9-61
9.3.1 Interface functions of GP-IB 2 port....9-61
9.3.2 Connection to GP-IB system....9-61
9.3.3 Address setting....9-62
9.3.4 X-Y plotter control....9-62
9.3.5 External unit control....9-62

Chapter 10 PRINCIPLE AND CIRCUIT CONFIGURATION....10-1

10.1 Configuration and Principle of Monochromator....10-2
10.1.1 Principle of monochromator....10-2
10.1.2 Grating diffraction orders....10-3
10.1.3 Signal detector....10-6
10.2 Circuit Configuration....10-7
10.3 Precautions on Measurement....10-8
10.3.1 Types of optical fiber usable in this equipment....10-8
10.3.2 Restriction on double monochromator....10-9
10.3.3 Restriction on resolution....10-9
10.3.4 Absolute level accuracy....10-9
10.3.5 Effective range of level axis when the measuring sensitivity is set to NORMAL RANGE HOLD....10-10
10.3.6 Stray light in the double monochromator mode....10-10

10.3.7 Step at 600 or 650 nm 10-10
10.3.8 Ripple around 1380 nm 10-10
10.3.9 Wavelength sensitivity below 400 nm and above 1700 nm 10-11
10.3.10 Level accuracy below fiber cable cutoff wavelength (short wave length) 10-11
10.3.11 Optical axis adjustment during spectrum output (AQ-6315B) 10-11

Chapter 11 MAINTENANCE 11-1

11.1 Mechanical Inspection 11-2
11.2 Operation Checks 11-2
11.2.1 Check when the power supply is turned on 11-2
11.2.2 Operation check for each switch 11-2
11.2.3 Wavelength accuracy check 11-2
11.2.4 Level accuracy check 11-4

Contents of Figure

Fig. 3-1 AQ-6315A Optical Spectrum Analyzer 3-2
Fig. 3-2 AQ-6315B Optical Spectrum Analyzer 3-3
Fig. 3-3 AQ-6315A/B Optical Spectrum Analyzer 3-3
Fig. 4-1 Initialize Screen 4-4
Fig. 4-2 Names of Screen Parts 4-5
Fig. 5-1 Power Range between Markers .... 5-32 to 33
Fig. 5-2 Setting Record Paper 5-127
Fig. 6-1 Screen Displayed by Pressing <PROGRAM EDIT> key 6-3
Fig. 6-2 Program Input Screen 6-5
Fig. 6-3 Screen Displayed by Pressing <PROGRAM EXECUTE> key 6-13
Fig. 6-4 Screen Displayed by Pressing <EXEC KEY DEFINE> key 6-14
Fig. 7-1 Floppy Disk and Drive 7-3
Fig. 8-1 Measurement Example by <AUTO> key 8-3
Fig. 8-2 Measurement Example Using Manual Operations 8-5
Fig. 8-3 Loss Wavelength Characteristic Measurement System 8-13
Fig. 8-4 Optical Filter Transmission Factor Measurement System 8-18
Fig. 8-5 Space Light Entering an Optical Fiber 8-30
Fig. 10-1 Basic Configuration of Monochromator 10-2
Fig. 10-2 Usable Divisions of Diffracted Orders 10-3
Fig. 10-3 Relationship between Displayed Wavelength and Real Wavelength 10-5
Fig. 10-4 Signal Detector Configuration 10-6
Fig. 10-5 Circuit Configuration of this Equipment 10-7

Contents of Table

Table 1-1 Specifications .... 1-3 to 4
Table 1-2 Option List .... 1-5 to 6
Table 1-3 Standard Accessory List 1-6
Table 3-1 Description of Panel Functions 3-4
Table 5-1 Waveforms that Can be Stored into Memory 5-72
Table 5-2 Output Item Setting .... 5-129 to 130
Table 5-3 List of X-Y plotters Recommendable Product........ 5-131
Table 5-4 Video Output Pin Connections (VGA compatible) 5-150
Table 5-5 Initial Value of Nonvolatile Data........ 5-153 to 158
Table 5-6 WARNING message List .... 5-159 to 161
Table 6-1 Error Table for Program Execution .... 6-16 to 17
Table 6-2 Panel Switch Command List .... 6-21 to 40
Table 6-3 Special Command List........ 6-41 to 45
Table 7-1 Types and Sizes of Files........ 7-2
Table 7-2 Floppy Disk Capacity 7-2
Table 8-1 Measuring Sensitivity Selection 8-6
Table 8-2 Spectral Width Algorithms 8-9
Table 8-3 Method of Moving Wavelength Line Marker........ 8-23
Table 8-4 Method of Moving Level Line Marker........ 8-24
Table 9-1 Interface Functions of the GP-IB 1 port........ 9-3
Table 9-2 GP-IB Program Codes........ 9-5 to 35
Table 9-3 Delimiter Specifying Codes........ 9-36
Table 9-4 Output Data Formats .... 9-37 to 47
Table 9-5 Program Codes Related to SRQ Transmission 9-48
Table 9-6 Contents of Status Byte 9-49
Table 9-7 Interface Functions of GP-IB 2 Port 9-61
Table 10-1 Switching Wavelength of Filter 10-4
Table 10-2 Sensor Switching Points 10-6
Table 10-3 Adaptability of Optical Fibers and Restrictions........ 10-8

Attached Drawings

AQ-6315A Appearance of Optical Spectrum Analyzer ASD-62436-1-1/4

AQ-6315A Front View of Optical Spectrum Analyzer ASD-62436-1-2/4

AQ-6315A Rear View of Optical Spectrum Analyzer ASD-62436-1-3/4

AQ-6315A Plane View of Optical Spectrum Analyzer ASD-62436-1-4/4

AQ-6315B Appearance of Optical Spectrum Analyzer ASD-62408-1-1/4

AQ-6315B Front View of Optical Spectrum Analyzer ....,.......................... ASD-62408-1-2/4

AQ-6315B Rear View of Optical Spectrum Analyzer ASD-62408-1-3/4

AQ-6315B Plane View of Optical Spectrum Analyzer ASD-62408-1-4/4

Chapter 1 GENERAL

This chapter describes an outline of this equipment.

Contents of Chapter 1

1.1 Outline of Equipment 1-2
1.2 Specifications 1-2
1.3 Options 1-2
1.4 Configuration 1-2
1.5 Precautions on Handling 1-7
  1.5.1 Operating temperature range 1-7
  1.5.2 Environmental conditions 1-7

1.1 Outline of Equipment

This equipment is an optical spectrum analyzer that permits measuring the spectrums of light sources such as LD and LED and also the loss wavelength characteristics and transmission characteristics of optical fiber cables, optical filters, etc.

The measurable wavelength range is as wide as 350 to 1750 nm.

This permits optical spectrum analysis of the visible ray area to the near infra-red ray area.

The equipment is provided with not only the basic performance of high-speed sweep, high-sensitivity, high-accuracy, wide dynamic range and excellent linearity but also many functions such as three-dimensional display, various data processing function and program measuring function.

As data output functions, the equipment is capable of hard-copying screens through a built-in high-speed printer, plotting waveforms through an external X-Y plotter, and reading/writing waveforms and programs through a built-in floppy disk.

Besides, the equipment is equipped with GP-IB as the standard configuration, thereby exerting full remote control.

1.2 Specifications

Table 1-1 shows the specifications of this equipment.

1.3 Options

Table 1-2 shows the options of this equipment.

1.4 Configuration

In the standard configuration, this equipment consists of the accessories shown in the Table 1-3 Standard Accessory List.

Table 1-1 Specifications (1/2)

		Single monochromator mode	Double monochromator mode
Applicable fiber		SM to large-caliber fiber (core diameter 800 μm)	SM, GI (50/62.5 μm)
Measurement wavelength range		350 to 1750 nm	
Wavelength span		0 to 1500 nm	
Wavelength accuracy		±0.5 nm (25±5°C, 10/125 SM fiber) ±0.05 nm (1510 to 1570 nm) (Note1) (Note2) ∗	
Wavelength linearity (Note2)		±0.02 nm (1510 to 1570 nm) ∗	
Wavelength reproducibility		±0.005 nm (1 minute)	
Wavelength resolution		0.05 to 10 nm	
Measurement level range (Note 3)		–90 to +20 dBm (1000 to 1600 nm) –85 to +20 dBm (600 to 1000 nm) –75 to +20 dBm (350 to 1750 nm)	–85 to +20 dBm (1200 to 1600 nm) –80 to +20 dBm (600 to 1200 nm) –65 to +20 dBm (350 to 1750 nm)
Level accuracy (Note 4)		±0.3 dB (at 633/1310/1550 nm)	
Polarization dependency (Note 5)		±0.1 dB (at 1310/1550 nm)	±0.05 dB (at 1310/1550 nm)
Linearity (Note 6)		±0.05 dB (0 to –20 dBm), ±0.1 dB (0 to –40 dBm), ±0.2 dB (0 to –60 dBm)	
Level scale		0.1 to 10 dB/div. and linear	
Dynamic range (Stray light level) (Note 7)		40 dB (±1 nm, 633/1152/1523 nm) 35 dB (±0.5 nm, 633/1152/1523 nm)	70 dB (±1 nm, 633/1152/1523 nm) 60 dB (±0.5 nm, 633/1152/1523 nm)
Sweep time (Note 8)		0.5 sec or less (span 500 nm or less) 2.5 sec or less (full span)	
Functions	Measurement	Automatic measurement, marker-to-marker sweep, Averaging, pulse light measurement, power meter function, measuring sensitivity selecting function	
	Display	Three-dimensional display, spilt (dual) display	
	Individual 3-trace memories	Maximum/minimum hold display, normalization display, curve fit display, dominant wavelength display, data calculation (addition, subtraction, division), power density display function, dB/km, % level scale	
	Data analysis	Peak/bottom search, spectral width search, side mode suppression ratio search, maker-to-marker power measurement, optical amplifier NF search, color analysis, WDM analysis function, notch width measurement function	
	Others	Programming function (200 steps ×20 programs), wavelength calibration function, calendar/clock function, help function, user key define function, labeling function	
Optical output (Note 9)		Resolution setting range : 0.05 to 10 nm Insertion loss : 20 dB or less (1310/1550 nm, 25±5°C, resolution 0.5 nm or more) Optical fiber : G150/125 μm)	
Memory	Built-in FDD	3.5-inch 2HD (1.2/1.44 M bytes, automatic selection), waveform + program	
	Internal memory	Waveform data and measuring condition storage (for 32 waveform), 20 programs	

Table 1-1 Specifications (2/2)

<table>
<tr><th colspan="2"></th><th>Single monochromator mode</th><th>Double monochromator mode</th></tr>
<tr><td rowspan="2">Data output</td><td>Printer</td><td colspan="2">Built-in high-speed printer</td></tr>
<tr><td>Plotter</td><td colspan="2">Direct output to external X-Y plotter</td></tr>
<tr><td rowspan="2">Interface</td><td>GP-IB</td><td colspan="2">2 ports equipped in the standard configuration</td></tr>
<tr><td>Others</td><td colspan="2">SWEEP trigger input (TTL), SAMPLE trigger input (TTL), SAMPLE trigger output (TTL), SAMPLE enable input (TTL), 270 Hz output (TTL), analog output (0 to 5 V), video output (VGA compatible)</td></tr>
<tr><td colspan="2">Display</td><td colspan="2">9.4-inch color LCD, resolution : 640 × 480 dots</td></tr>
<tr><td colspan="2">Optical input connector</td><td colspan="2">FC (standard), SC, D4, W/E, ST, DIN, etc.</td></tr>
<tr><td colspan="2">Power supply</td><td colspan="2">AC 100 to 120 V, 200 to 240 V, 48 to 63 Hz, approx. 200 VA</td></tr>
<tr><td colspan="2">Environmental conditions</td><td colspan="2">Operating temperature : 5 to 40 °C
Storage temperature : −10 to 50 °C
Humidity : 80% or less (no condensation)</td></tr>
<tr><td colspan="2">Dimensions and mass</td><td colspan="2">Approx. 222 (H) × 425 (W) × 450 (D) mm, approx. 30 kg</td></tr>
</table>

* *: These marked specifications are valid with instruments shipped on October 1997 and later*

Note 1 : Within 24 hours after user calibration with 1523 nm He-Ne laser, and within ±1 °C in temparature variation after user calibration

Note 2 : 10/125 SM fiber, 25±5 °C, resolution 0.05 nm, after 2 hours warming-up

Note 3 : 25±5 °C, resolution 0.5 nm or more

Note 4 : 10/125 SM fiber, 25±5 °C, input level −30 dBm, resolution 0.5 nm or more

Note 5 : 10/125 SM fiber, 25±5 °C, resolution 0.5 nm or more

Note 6 : 25±5 °C, sensitivity HIGH 3

Note 7 : 10/125 SM fiber, 25±5 °C, resolution 0.05 nm, excluding high-order and low-order harmonics

Note 8 : 1-trace display, sampling point : 501,
sensitivity : NORMAL HOLD,
number of averaging times : 1
No selection of diffraction degree in the sweep range except the full span.

Note 9 : AQ-6315B only

Note 10 : The analyzer specifications such as level accuracy, measurement level range, and level linearity have been defined for the absolute power display

Table 1-2 Option List (1/2)

- AQ-4302 He-Ne laser
  (Light source for wavelength calibration)
  Emitted light wavelength : 632.8 nm
  Light output level : −8 dBm or more (with G150/125 µm fiber)
  −15 dBm or more (with SM10/125 µm fiber)

- AQ-4303B White light source
  (for less wavelength characteristic measurement)
  Emitted light wavelength : 400 to 1800 nm
  Optical output level : −45 dBm or more
  (Wavelength 850 nm and 1300 nm, wave length zone 10 nm with G150/125 µm fiber and CW light)
  Light emitting element : Halogen lamp

- AQ-9313 Device adapter
  (for CAN-type LD element characteristic measurement)
  Adaptable package : TO-5 (standard). Other packages (TO-46, TO-52, etc.) are adaptable.
  Usable fiber : SM10/125 µm with FC plug and collimator
  Rated current output : 5 to 150 mA

- AQ-9314B Parallel beam mount
  (for optical device/optical material loss wavelength characteristic measurement)
  External dimensions of measured material :
  10×15 mm or more, 50×50 mm or less, thickness 12 mm or less
  Connection loss : 5 dB or less (at a wavelength of 850 nm)
  Usable fiber : 800 µm large-caliber fiber (separately sold)

- Quartz cell for liquid measurement
  (When combined with the AQ-9314B parallel mount, this cell makes liquid permeability measurement.)
  Recommended product : T-56A-UV-3-1 (Japan Quartz Glass Co., Ltd.)

- AQ-9343 Collateral Beam Measuring adapter
  (For gas laser measurement)
  Usable fiber : SM10/125 µm with FC plug
  Maximum permissible diameter : Collateral beam having beam diameter of 6 mm or less
  Connection loss : 5 dB or less

Table 1-2 Option List (2/2)

- AQ-9346 Point light measuring adapter
  (for point light source measurement for LD and LED elements)
  This adapter is suitable for the case where LDs and LEDs are incorporated in the system and mounted on the following fine adjustment table. Select an optical fiber cord suitable for the light source and connect it.
  (This adapter is not attached to the optical fiber cord and fine adjustment table.)
  Output type : FC connector
  Recommended fine adjustment table :
  Σ-2001-(1) Precision XYZ composition (Sigma Koki)
- Large-diameter fiber cord
  (Used to input very weak light of LEDs to the optical spectrum analyzer)
  Recommended product : ST-800G-FV-D-95P (Mitsubishi Cable Industries)

Table 1-3 Standard Accessory List

Accessory name	Quantity	Remarks
Power code	1 pc	Approx. 3 m (for regular use)
Fuse	2 pcs.	(For regular use) (Note)
Instruction manual	1 copy	
Record paper	2 rolls	TF50KS-E2 (for built-in printer) (Jujo Paper)
Floppy disk	2 pcs.	3.5-inch 2HD

Note: 3.15A (Fast-Acting) for operation at 100 to 120 V
3.15A (Time-Lag) for operation at 200 to 240 V

1.5 Precautions on Handling

1.5.1 Operating temperature range

The operating temperature range guaranteed for this equipment is +5 to +40°C.

1.5.2 Environmental conditions

This equipment incorporating a very-high-precision monochromator requires extreme care about temperatures, shocks and vibrations when it is stored and transported.
In particular, when the equipment is operated over the following environmental conditions, its performance may not be restored.

Environmental Conditions

(1) Storage temperature range : − 10 to +50°C

(2) Vibration
Oscillation frequency : 10 Hz
Compound amplitude : 2 ± 0.5 mm
Direction of vibration : Up/down, left/right, forward/backward
Vibration time : 10 minutes each (in each direction of vibration)

(3) Shock
Shock equivalent to a natural drop when one side of the base is raised 2.5 cm in the static state on the hard wooden floor.

(4) Installation
When this equipment is installed in the vertical or reverse direction for a long time, the accuracy of its built-in monochrometer will be affected adversely.
During transportation and storage, this equipment must be kept level.

Chapter 2 PREPARATIONS BEFORE USE

This chapter describes unpacking, repacking and acceptance inspection and general precautions.
Before using this equipment, be sure to read this chapter to correctly operate it.

Contents of Chapter 2

2.1 Unpacking and Acceptance Inspection 2-2
  2.1.1 Mechanical checks 2-2
  2.1.2 Operation checks........ 2-2
2.2 Action to Be Taken upon Detection of Damage or Abnormality........ 2-2
2.3 Preparations and General Precautions........ 2-3
2.4 Safety Measures for Power Supply........ 2-4
  2.4.1 Protective earthing 2-4
2.5 Precautions in Use........ 2-5
2.6 Precautions on Storage 2-6
  2.6.1 Precautions before storage........ 2-6
  2.6.2 Recommendable storage conditions........ 2-6
2.7 Repacking and Transportation........ 2-7
  2.7.1 Repacking........ 2-7
  2.7.2 Transportation 2-7

2.1 Unpacking and Acceptance Inspection

This equipment undergoes both mechanical and electrical inspection before shipment from the plant, in order to guarantee its normal operation.
After receiving this equipment, perform unpacking at once and make checks to see if the equipment has not been damaged during transportation.
When performing unpacking, be careful not to give damage to the corrugated fiberboard case for inner package and cushion materials except consumable materials for packing such as packing paper and preserve them for reuse at a transfer.

2.1.1 Mechanical checks

Check the appearance, switch operations and connectors of this equipment to see if they have not been damaged or had any fault during transportation.
Collate the types and quantity of accessories and reserves with Table 1-3 Standard Accessory List.

2.1.2 Operation checks

After making sure that the mechanical operation is normal, make operation tests to make performance checks.
With these checks, it can be known whether the operation of this equipment conforms to the specifications shown in 1.2.
For the inspection procedure, refer to Chapter 11.

2.2 Action to Be Taken upon Detection of Damage or Abnormality

When any damage or specification fault is detected on this equipment at acceptance inspection, inform us (head office, branch or business office) of its contents at once.

2.3 Preparations and General Precautions

(1) Power supply

Use a power supply of AC 100 V to 240 V with a power supply frequency of 48 Hz to 63 Hz. Also, use a cable of the rated voltage that satisfies the operating voltage.

(2) Power cable

Please use the power cord attached to the instrument and make sure that the power supply plug socket is grounded.

(3) Fuse

When the power supply voltage is 100 to 120 V, use a 3.15 A fuse (Fast-Acting). When it is 200 to 240 V, use a 3.15 A fuse (Time-Lag).
The fuses shown in Table 1-3 (→ 1-4 Configuration) is attached in the standard equipment.
In case a fuse must be replaced because of a failure, clear up the cause of the failure and remove it before replacing the fuse.

DANGER

- *Before replacing a fuse, turn off the power switch and disconnect the power plug from the plug socket.*
  If fuse replacement is performed in the power ON status, an accident resulting in injury or death due to an electric shock may be caused.
- *After completion of fuse replacement, execute any of protective earthing operations described in 2.4.2 and check that the AC power supply voltage is proper. Then, turn on the power switch.*
  If the power supply is turned on without executing protective earthing, an accident resulting in injury or death due to an electric shock may be caused.
  In case of an improper AC power supply voltage, the insides of units may be damaged by abnormal voltage.

2.4 Safety Measures for Power Supply

When a power supply of AC 100 V to 240 V, 48 to 63 Hz, is connected, the equipment will normally function. However, it is necessary to feed the AC power supply after taking preventive measures against the following points.

- Accident resulting in injury or death, due to electric shocks
- Damage within units due to abnormal voltages
- Trouble due to earth current

2.4.1 Protective earthing

This equipment is of protective structure against electric shocks by means of protective earthing and classified as Safety Class I.

By connecting the earth pin of the 3-pole power cord to the power supply plug socket, this equipment is earthed so that an accident of electric shock due to the AC power supply can be prevented.

This equipment also conforms to the safety standards of IEC65 and 348.

2.5 Precautions in Use

(1) Screen display unit

A color LCD module (hereinafter shall be referred to LCD) is adopted in the screen display unit of this equipment. A filter plate is provided in front side of this LCD. If a strong shock is given to this filter plate, it might crack the filter plate or the LCD itself is damaged. To avoid it, be careful to its handling.

(2) If such phenomena occur

If the following phenomena occur in the light during measurement, there is a possibility that dust sticks to the end surface of the optical fiber cord which connects the light source to this equipment. In such a case, wipe clean the end surface of optical fiber cord with alcohol, etc.:

- Deterioration of resolution
- Wavelength error
- Occurrence of a level error

2.6 Precautions on Storage

The precautions on storing this equipment for a long time will be described below.

2.6.1 Precautions before storage

(1) Wipe off the dust, hand-stain (finger mark), dirt, stain, etc. adhering on this equipment.

(2) Execute 11.2 Operation Checks to see that this equipment can normally function.

(3) Avoid storing this equipment in the following places:

1) Place exposed to direct sunlight or dusty place
2) High-humidity place that may cause waterdrop adhesion or waterdrop generation.
3) Place that may be affected by active gas or place that may oxidize units.
4) Place where the temperature and humidity levels are as shown below.
   - Temperature ....> 50°C, < −10°C
   - Humidity ....> 80%

2.6.2 Recommendable storage conditions

For long-term storage, it is desirable to satisfy the following environmental conditions as well as observe the precautions before storage described in 2.6.1.

- Temperature .... 5 to 30°C
- Humidity .... 40 to 70%
- Slight change in temperature and humidity in the day

For reuse after storage, execute 11.2 Operation Checks to see that this equipment can normally function.

2.7 Repacking and Transportation

When this equipment is reused or repaired at a remote place, the problems of repacking and transportation must be settled.

2.7.1 Repacking

Use the packing materials, as they are, which were used for the first delivery. If the packing materials are thrown away or broken, perform packing in the following way.

(1) Apply cushions to protect the protrusive portions of the front panel and rear panel of this equipment.

(2) Wrap up this equipment in vinyl sheets.

(3) Prepare a corrugated fiberboard case, wooden case or aluminum case with a space of 10 to 15 cm in each direction of this equipment.

(4) Put this equipment in the middle of the case and fill the space of 10 to 15 cm in each direction of this equipment with sufficient cushioning materials to absorb shocks due to vibrations.

(5) Fix the outside of the case firmly with packing strings, adhesive tapes or bands.

NOTE

The reuse of the packing materials which were used for the first delivery makes it easy to repack the equipment. Please preserve these packing materials.

2.7.2 Transportation

We recommend you to avoid vibrations as much as possible and satisfy the recommendable storage conditions described in 2.6.2 for transportation.

Chapter 3 DESCRIPTION OF FUNCTIONS

This chapter describes the functions of this equipment.

Contents of Chapter 3

3.1 Names and Functions of Panels 3-2

3.2 Software Functions 3-5

3.1 Names and Functions of Panels

Figure 3-1 to Fig. 3-3 show the names of the panels of this equipment and Table 3-1 shows the functions of these panels. The encircled numbers in the figures correspond to the encircled numbers in the number column of the table.

Front Panel

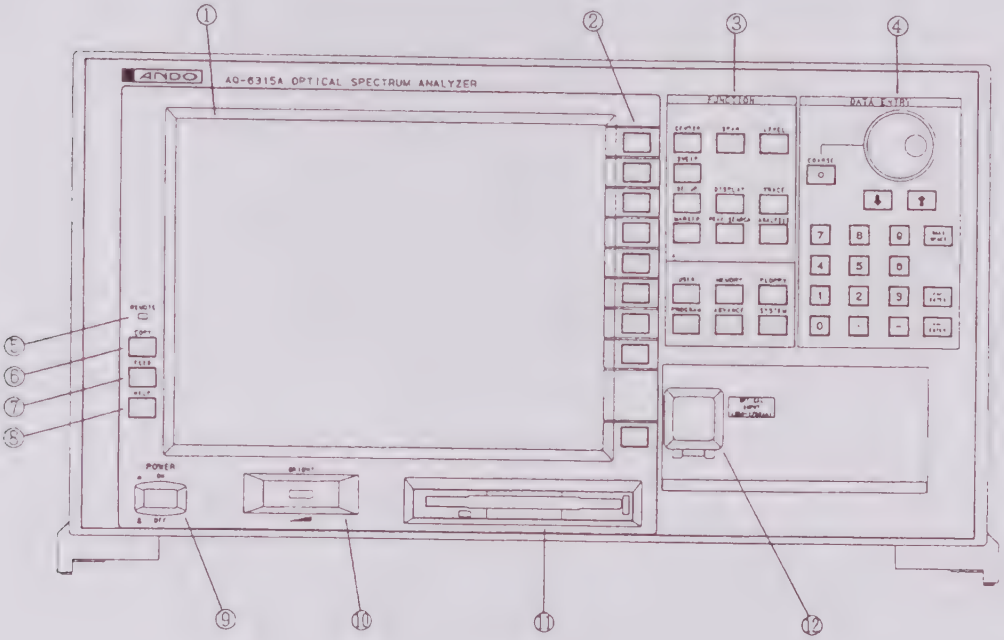


Fig. 3-1 AQ-6315A Optical Spectrum Analyzer

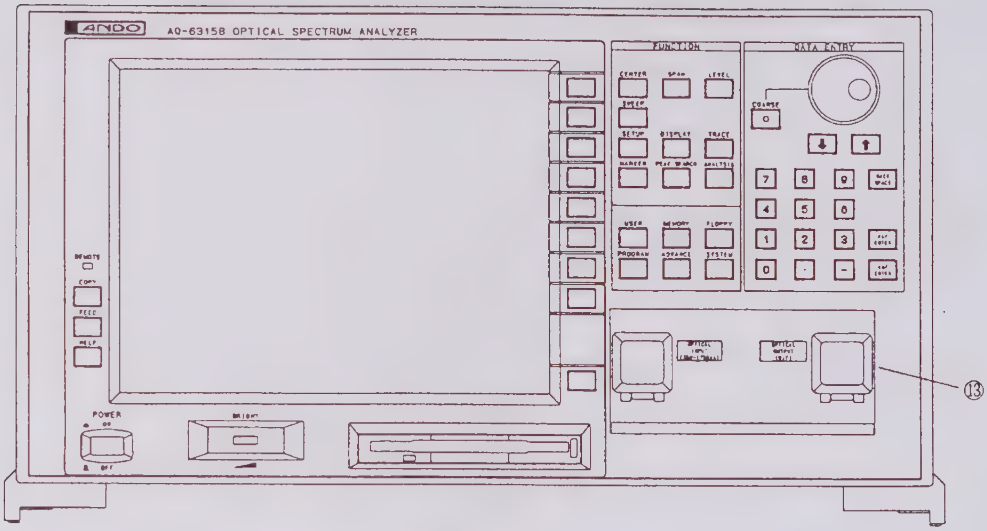


Fig. 3-2 AQ-6315B Optical Spectrum Analyzer

Rear Panel

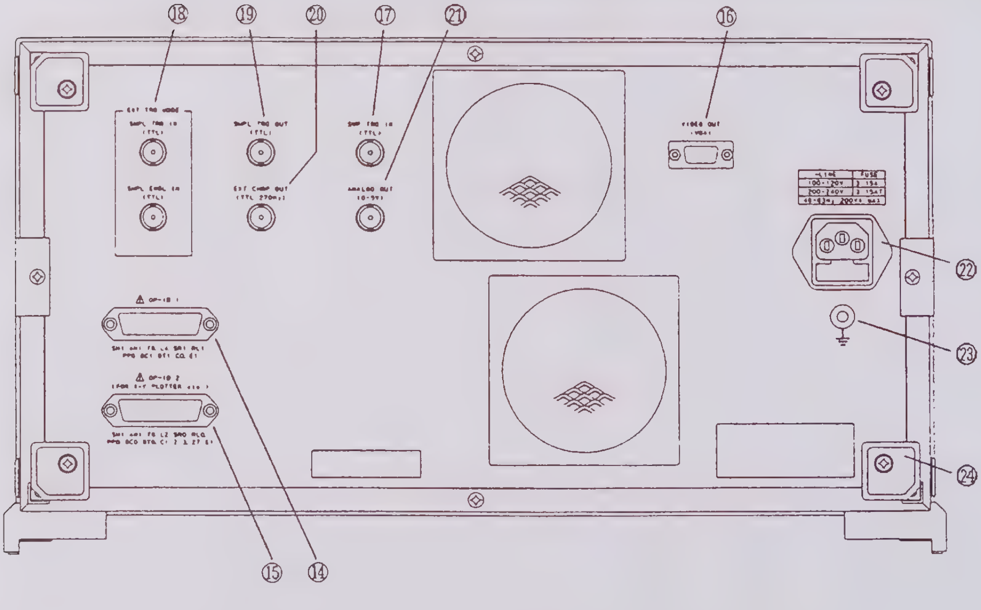


Fig. 3-3 AQ-6315A/B Optical Spectrum Analyzer

Table 3-1 Description of Panel Functions

No.	Name	Description of function
①	LCD display	Displays measured waveforms, measuring conditions, measured values, etc.
②	Soft key switch	Used to execute the function of each switch.
③	[FUNCTION] section	Used to perform setting for every measurement (sweep, measuring conditions, data analysis and various functions).
④	[DATA ENTRY] section	Used to enter measuring condition parameters and labels.
⑤	Remote lamp	Comes on when this equipment is in the remote status.
⑥	[COPY]	Used to execute printer functions
⑦	[FEED]	Used to feed record paper
⑧	[HELP]	Used to check the contents of the soft key menu displayed on the screen.
⑨	[POWER]	Power switch
⑩	[BRIGHT]	LCD brightness adjusting control
⑪	Floppy disk drive (3.5 inches)	Used to store waveform data, programs, etc
⑫	[OPTICAL INPUT]	Optical input connector
⑬	[OPTICAL OUTPUT]	Optical output connector
⑭	[GP-IB 1]	GP-IB port to control this equipment from an external computer
⑮	[GP-IB 2]	GP-IB port to control external units (X-Y plotter, etc.) while this equipment functions as a system controller on the GP-IB bus
⑯	[VIDEO OUT (VGA)]	Connector to output analog RGB video signals (conforming to VGA)
⑰	[SWP TRG IN]	Connector to input sweep trigger signals
⑱	[EXT TRG MODE]	Connector to input control signals synchronized with measured light from outside
⑲	[SMPL TRG OUT]	Connector to output measurement trigger signals
⑳	[EXT CHOP OUT]	Connector to output reference signals (TTL level) of external modulation
㉑	[ANALOG OUT]	Connector to output electric signals proportional to the measurement level
㉒	AC power connector	Input the AC power through the attached power cord.
㉓	Earth terminal	Earth terminal
㉔	Cord winding leg	Leg to wind the power cord.

3.2 Software Functions

All system functions can be controlled from a distant place via GPIB interface. For the GPIB details, see Chapter 9 "GPIB function".

Chapter 4 USAGE

This chapter outlines how to handle and operate this equipment.

Contents of Chapter 4

4.1 Preparations and Operation Checks 4-2
  4.1.1 Preparations before powering ON....................4-2
  4.1.2 Connections to other units 4-2
  4.1.3 Power ON and screen display 4-3
  4.1.4 Stop procedure 4-4
4.2 Operations....................4-5
  4.2.1 Description of screen 4-5
  4.2.2 Description of means for entering parameters 4-6
  4.2.3 Soft key execute form 4-8
  4.2.4 "WARNING" display....................4-8

4.1 Preparations and Operation Checks

This section describes the items that you should perform or the items of which you should have knowledge before operating this equipment.

4.1.1 Preparations before powering ON

Make the following checks before inserting the power cord of this equipment into the commercial power plug socket

(1) Turn off the [POWER] switch.

(2) Check that the voltage of the power plug socket conforms to the power supply voltage of this equipment.

(3) To avoid electric shocks, be sure to earth the earth terminal on the rear panel and the earth terminal of the power cord.

(4) Before fuse replacement, be sure to turn off the [POWER] switch and disconnect the power cord from the power plug socket.

(5) Avoid operating this equipment in those places that cause strong vibrations or are humid and dusty, exposed to direct sunlight, affected by active gas, or inclined or may cause an overturn.

4.1.2 Connections to other units

Before connecting this equipment to an external computer, X-Y plotter and CRT display, make a wiring check and turn off the power switch of this equipment and those of these units.
If this equipment is connected on the power ON status, it may be damaged.

4.1.3 Power ON and screen display

After checking the power ON and connection status according to 4.1.1 and 4.1.2, turn on the power supply according to the following procedure.

(1) Press the [POWER] switch to turn on the power supply.

(2) "MEMORY CHECKING" blinks on the upper left part of the screen and an internal memory check and initialize processing are executed.

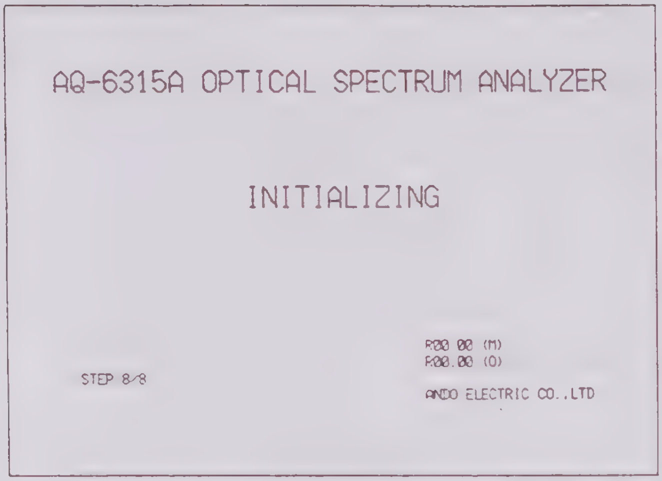
(3) After completion of the memory check, the screen shown in Fig. 4-1 is displayed and internal initialize processing is started. At this time, "STEP 1/8" - "STEP 8/8" are displayed indicating the progress status of the initialize processing.

(4) After normal completion of the initialize processing, the screen shown in Fig. 4-1 disappears and the previous power OFF screen is displayed.

(5) If any error occurs in memory during the initialize processing in (2), an error message is displayed according to the cause of the error and the processing stops.
If any fault occurs in the initialize processing in (3), "STEP 0/8" is displayed and the processing stops halfway. (The screen shown is Fig. 4-1 is continuously displayed.)

NOTE

In this equipment, the measuring conditions, soft key setting, displayed waveforms are stored in nonvolatile memory.
When the power supply is turned on, the previous power OFF status is restored.



```
AQ-6315A OPTICAL SPECTRUM ANALYZER

INITIALIZING

                                     R00 00 (M)
                                     R00.00 (O)
STEP 8/8
                                     ANDO ELECTRIC CO..LTD
```

Fig. 4-1 Initialize Screen

4.1.4 Stop procedure

(1) Turn off the [POWER] switch.

(2) Disconnect the optical fiber cord connected to the [OPTICAL INPUT] connector and close the cover.

(3) Pull out the power cable from the power plug socket.
Wind the power cord on the cord winding leg on the rear side.

4.2 Operations

This section describes how to operate this equipment.

4.2.1 Description of screen

On the screen of this equipment, measuring conditions, marker values and other data as well as measured waveforms are displayed. The name of each part of the screen is shown below.

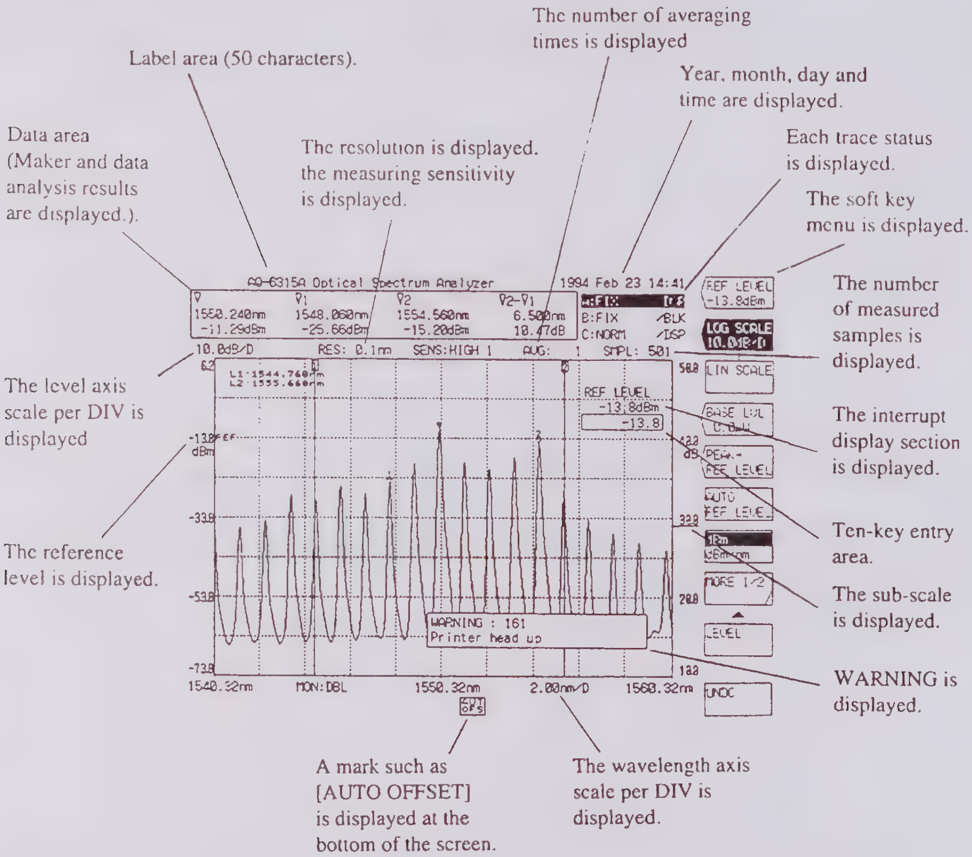
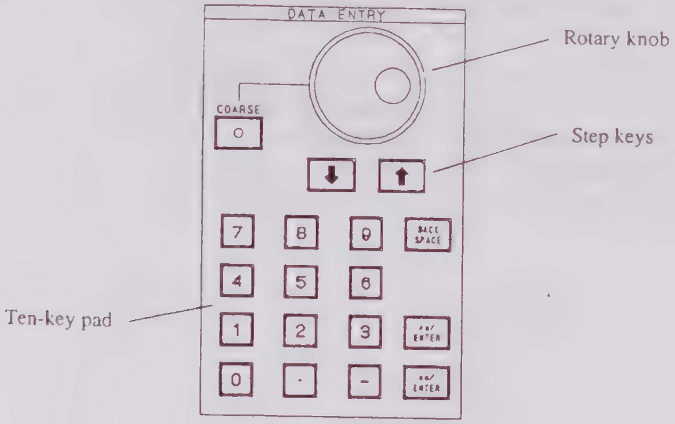

The number of averaging times is displayed
Label area (50 characters).
Year, month, day and time are displayed.
Data area (Maker and data analysis results are displayed.).
The resolution is displayed, the measuring sensitivity is displayed.
Each trace status is displayed.
The soft key menu is displayed.
The number of measured samples is displayed.
The level axis scale per DIV is displayed
The interrupt display section is displayed.
The reference level is displayed.
Ten-key entry area.
The sub-scale is displayed.
WARNING is displayed.
A mark such as [AUTO OFFSET] is displayed at the bottom of the screen.
The wavelength axis scale per DIV is displayed.
AQ-6315A Optical Spectrum Analyzer
1994 Feb 23 14:41
1550.240nm
-11.29dBm
1548.060nm
-25.66dBm
1554.560nm
-15.20dBm
6.500nm
10.47dB
B:FIX
C:NORM
/BLK
/DSP
10.0dB/D
RES: 0.1nm
SENS:HIGH 1
AVG: 1
SMPL: 501
REF LEVEL
-13.8dBm
-13.8
WARNING : 161
Printer head up
1540.32nm
MON:DBL
1550.32nm
2.00nm/D
1560.32nm
REF LEVEL
LOG SCALE
LIN SCALE
BASE LVL
PEAK→REF LEVEL
AUTO REF LEVEL
MORE 1/2
LEVEL
UNDO

Fig. 4-2 Names of Screen Parts

4.2.2 Description of means for entering parameters

This equipment is provided with 3 types of means for entering parameters such as measuring conditions, namely, a rotary knob, step keys and a ten-key pad.



(1) Entry by rotary knob

When the Soft key with parameter is pressed, the current set value is displayed in the interrupt display section. When the rotary knob is turned, the numeric value in the interrupt display section is incremented or decremented (increment: clockwise, decrement: counterclockwise), and also the internal setting is changed.

While the [COARSE] switch is ON (lamp ON), the numeric value is changed in coarse.

(2) Enter by step keys ([↑], [↓])

When the [↑] key is pressed, the same operation as clockwise turn of the rotary knob is performed. Likewise, when the [↓] key is pressed, the same operation as counterclockwise turn of the rotary knob is performed. When the key is continuously pressed for 0.5 second or more, an auto repeat operation is performed.

In the three-dimensional display mode, select a waveform to display the marker using a step key.

Use the rotary control knob or numeric keys to change the parameters.

(3) Entry by ten-key pad

When any key in the ten-key pad is pressed while the current set value is displayed in the interrupt display section by pressing the soft key with parameter, the ten-key entry area appears and the pressed numeric value is displayed in this area.

To set the numeric value in the frame, press the key corresponding to the unit of the parameter to be entered out of the [μm/ENTER] and [nm/ENTER] keys. Then, The numeric value in the ten-key entry area is reflected in the interrupt display section and internally set. For a parameter without any unit, press the either key.

If a wrong key is pressed during ten-key entry, press the [BACK SPACE] key. Then, the number lastly entered (at the right end) in the ten-key entry area disappears and a correct number can be entered anew.

If the [BACK SPACE] key is continuously pressed to make the ten-key entry area empty, the ten-key entry status disappears and a return can be made to the status precedent to ten-key entry.

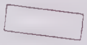
If the value entered through the ten-key pad does not agree with the settable value, the nearest value to the settable value is set.

4.2.3 Soft key execute form

When a panel switch of this equipment is pressed, the function related to the switch is displayed as a soft key menu at the right end of the screen. When the corresponding key is pressed, the function is executed. There is also a switch that can execute a function by pressing key. The following 5 soft key execute forms are available

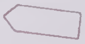
(1) The soft key display is executed by pressing the corresponding key.

Soft key form



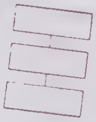
(2) When the soft key is pressed, the set value is displayed in the interrupt display area and it can be changed using the rotary control knob, step keys or numeric keys. The window may be displayed instead of the interrupt display area.

Soft key form:



(3) When a panel switch is pressed, a function to be executed is selected among multiple soft keys. The selected key displayed in reverse video
When another key is pressed, the display in reverse video proceeds to the key

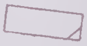
Soft key form



(4) Each time a soft key is pressed, the key display in reverse video/key display in non-reverse video is switched alternately.
In this manual, this is represented as "toggle".

5) When the soft key is pressed, the related soft keys are displayed.

Soft key form:



2.4 "WARNING" display

is equipment, if a failure has occurred due to an incorrect operation on this equipment, a window is ed on the screen and a message is displayed. For this function, refer to 5.9 WARNING display ion.

Chapter 5 DETAILS OF FUNCTIONS

This chapter details the functions of individual switches in this equipment.

Contents of Chapter 5

5.1 Detailed Description of [FUNCTION] Section 5-3
    5.1.1 [SWEEP] switch 5-3
    5.1.2 [CENTER] switch 5-6
    5.1.3 [SPAN] switch 5-10
    5.1.4 [LEVEL] switch 5-12
    5.1.5 [SETUP] switch 5-19
    5.1.6 [MARKER] switch 5-23
    5.1.7 [PEAK SEARCH] switch 5-27
    5.1.8 [ANALYSIS] switch 5-30
    5.1.9 [TRACE] switch 5-51
    5.1.10 [DISPLAY] switch 5-63
    5.1.11 [MEMORY] switch 5-72
    5.1.12 [FLOPPY] switch 5-78
    5.1.13 [PROGRAM] switch 5-97
    5.1.14 [SYSTEM] switch 5-105
    5.1.15 [ADVANCE] switch 5-122
    5.1.16 [USER] switch 5-126
    5.1.17 [HELP] switch 5-126
    5.1.18 [COPY] switch 5-126
    5.1.19 [FEED] switch 5-132
    5.1.20 [AUXILIARY] switch 5-132
5.2 Detailed Description of Measuring Functions 5-133
    5.2.1 Pulse light measuring function 5-133
    5.2.2 External chop function 5-135
    5.2.3 Power meter function 5-136
    5.2.4 Optical output function (AQ-6315B only) 5-136
    5.2.5 Analog output function 5-137
    5.2.6 Power density display function 5-137

5.3 Detailed Description of Analysis Function 5-139
- 5.3.1 NF measuring function 5-139
- 5.3.2 Curve fit function 5-142
- 5.3.3 WDM analysis function 5-143

5.4 Spectrum Width data calculation Algorithm 5-145
- 5.4.1 Envelope method 5-145
- 5.4.2 Threshold method 5-147
- 5.4.3 RMS (effective value) method 5-148
- 5.4.4 Notch width measurement methods 5-149

5.5 Video Output Specifications 5-150

5.6 Nonvolatile Data Initialize Function 5-151

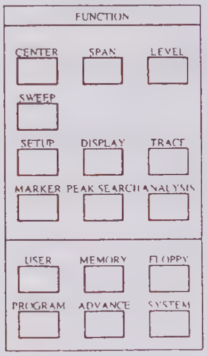
5.7 Wavelength Calibrate Function 5-152

5.8 Setting Clock 5-152

5.9 WARNING Display Function 5-152

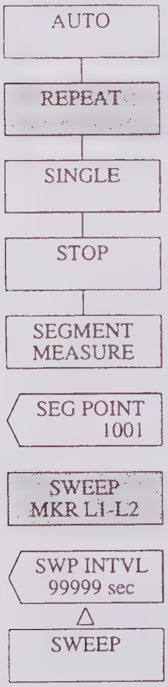
5.1 Detailed Description of [FUNCTION] Section

This section performs the setting related to every measurement (sweep, measuring conditions, data analysis and various functions).



5.1.1 [SWEEP] switch

The related functions of the SWEEP switch have been grouped in this switch area.
When this switch is pressed, the soft key menu shown in the following figure is displayed.



AUTO	Starts an automatic sweep
REPEAT	Performs a repeat sweep.
SINGLE	Performs a single sweep.
STOP	Stops a sweep.
SEGMENT MEASURE	Makes measurements according to the set number of points.
SEG POINT 1001	Sets the measurement sampling count when the <SEGMENT MEASURE> key is pressed.
SWEEP MKR L1-L2	Sets the measuring range at a sweep. (Toggle)
SWP INTVL 99999 sec	Sets the WAIT time between sweeps when a repeat sweep is performed.

(1) <AUTO> key

Sets measuring conditions automatically to the optimum status according to the input light.
When this key is pressed, the soft key is displayed in reverse video and the optimum conditions (center wavelength, sweep width, reference level and resolution) suitable for measuring input light is obtained.
After that, the reverse video proceeds to the <REPEAT> key and a repeat sweep is performed.
If the measuring conditions are not converged, sweeps are stopped, and displays WARNING.
During execution, only the <REPEAT>, <SINGLE>, <STOP> and <UNDO> keys are effective.

(2) <REPEAT> key

Performs a repeat sweep.
When this key is pressed, the soft key is displayed in reverse video and a repeat sweep is started.

(3) <SINGLE> key

Performs a single sweep.
When this key is pressed, the soft key is displayed in reverse video and a single sweep is started.

(4) <STOP> key

Stops a sweep.

(5) <SEGMENT MEASURE> key

Makes measurements according to the sampling count set by the <SEG POINT> key, starting from the stop position at that time.

(6) <SEG POINT> key

Sets the sampling count for execution of SEGMENT MEASURE.
When this key is pressed, the current sampling count is displayed in the interrupt display section.
The allowable setting range is 1 to 1001 and the sampling count is set by the rotary knob, step keys or ten-key pad.

(7) <SWEEP MKR L1-L2> key

Sets the sweep range for sweep.
When this key is displayed in reverse video, a sweep is performed between the wavelength line markers 1 and 2 (WL1 and WL2). When the key is displayed in non-reverse video, a sweep is performed within the effective range of the screen.

NOTE

When both WL1 and WL2 are set, a sweep is performed between the line marker 1 and 2.

When only WL1 is set, a sweep is performed from the line marker 1 to the right end of the screen.

When only WL2 is set, a sweep is performed from the left end of the screen to the line marker 2.

When WL1 and WL2 are not set, a sweep is performed within the effective range of the screen.

When WL1 and WL2 are set out of the sweep range (330 to 1770 mm), a sweep is performed within the sweep range.

In the reverse video status, SWP 1-2 is displayed at the bottom of the screen.

(8) <SWP INTVL> key

Sets the time from a start of a sweep till a start of the next sweep in the repeat sweep mode.

If the time required for sweeps is longer than the set time, the next sweep is started as soon as a sweep ends.

When this key is pressed, the current set time is displayed in the interrupt display section.

The allowable setting range is MINIMUM and 1 to 99999 sec and the rotary knob, step keys or ten-key pad is used for setting.

When 0 is entered through the ten-key pad, MINIMUM is set.

For setting by using the rotary knob or step keys and setting by using the ten-key pad, refer to 4.2.2.

In the reverse video status, SWP INT is displayed at the bottom of the screen.

5.1.2 [CENTER] switch

The related center wavelength setup functions have been grouped in the CENTER switch area.
When this switch is pressed, the soft key menu of ① is displayed and the function of <CENTER> key is performed.

①

CENTER 1234.56 nm	Sets the center wavelength.
START WL 1234.56 nm	Sets the measurement start wavelength.
STOP WL 1234.56 nm	Sets the measurement end wavelength.
PEAK→ CENTER	Searches the peak wavelength of the waveform internally and sets the center wavelength.
AUTO CENTER	Sets the peak wavelength to the center wavelength at each sweep. (Toggle)
CENTER 1 1310.00 nm	Sets the center wavelength to 1310.00 nm.
CENTER 2 1550.00 nm	Sets the center wavelength to 1550.00 nm.
MORE 1/2	Displays the soft key menu of 2/2.

△

CENTER

②:

CENTER 3 441.46 nm	Sets the center wavelength to 441.46 nm or 441.59 nm.
CENTER 4 487.99 nm	Sets the center wavelength to 487.99 nm or 488.13 nm.
CENTER 5 514.53 nm	Sets the center wavelength to 514.53 nm or 514.67 nm.
CENTER 6 632.82 nm	Sets the center wavelength to 632.82 nm or 632.99 nm.
CENTER 7 1152.27 nm	Sets the center wavelength to 1152.27 nm or 1152.59 nm.
CENTER 8 1523.07 nm	Sets the center wavelength to 1523.07 nm or 1523.49 nm.
MORE 2/2	Displays the soft key menu of 1/2.
△	
CENTER	

(1) <CENTER> key

Sets the center wavelength.

The allowable setting range is 350.00 to 1750.00 nm (0.01 step) and the rotary knob, step keys or ten-key pad are used for setting.

When the setting has been changed, waveform rewrite processing is performed.

At this time, the measurement start wavelength and measurement end wavelength are also changed.

(2) <START WL> key

Sets the measurement start wavelength.

When this key is pressed, the current measurement start wavelength is displayed in the interrupt display section.

The allowable setting range is –400.00 to 1750.00 nm (0.01 step) and the rotary knob, step keys or ten-key pad are used for setting.

When the setting has been changed, waveform rewrite processing is performed.

(3) <STOP WL> key

Sets the measurement end wavelength.

When this key is pressed, the current measurement end wavelength is displayed in the interrupt display section.

The allowable setting range is 350.00 to 2500.00 nm (0.01 step) and the rotary knob, step keys or ten-key pad is used for setting.

When the setting has been changed, waveform rewrite processing is performed.

When setting the measurement start wavelength, the measurement end wavelength is fixed.
When setting the measurement end wavelength, the measurement start wavelength is fixed. For this reason, sweep width setting is changed. The center wavelength setting is also changed at the same time.
When the ten-key pad is used for setting, the settable nearest value is set.

(4) <PEAK → CENTER> key

Searches the peak of the active trace internally, sets the center wavelength, and performs waveform rewriting.

After execution, the set center wavelength is displayed in the interrupt display section. At this time, center wavelength setting, measurement start wavelength setting and measurement end wavelength setting are changed.

The center wavelength can be set in succession by using the rotary knob, step keys or ten-key pad.

The allowable setting range is 350.00 to 1750.00 nm (0.01 step).

(5) <AUTO CENTER> key

Sets the ON/OFF status of the PEAK → CENTER function to be executed at each sweep. When this key is selected, the peak level is searched from the active trace waveforms automatically during each sweep and the peak level is set to the center wavelength. This key does not function while the active trace is in the MAX HOLD, MIN HOLD, CALC, EFFECT, or ROLL AVG status.

In the reverse video status, AUT CTR is displayed at the bottom of the screen.

(6) <CENTER 1****.**nm> ~<CENTER 8 key ****.**nm> keys

Sets the center wavelength in preset value (****.**nm).

When this key is pressed, the center wavelength is set in ****.**nm and waveform rewrite processing is performed.

At this time, it is also reflected in the interrupt display section. (****.** : Wavelength value shown in the soft key menu.)

Preset value of center wavelength varies depending on to which of air wavelength or vacuum wavelength this device is set.

For this setting, refer to (7) <MEAS WL AIR VAC> key in 5.1.14 [SYSTEM] switch.

Preset values displayed in the soft key menu change depending on the mode, as shown below.

(unit: nm)

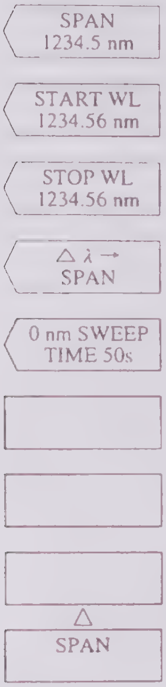
Mode Center	Air wavelength	Vacuum wavelength
1	1310.00	1310.00
2	1550.00	1550.00
3	441.46	441.59
4	487.99	448.13
5	514.53	514.67
6	632.82	632.99
7	1152.27	1152.59
8	1523.07	1523.49

After execution, center wavelength setting, measurement start wavelength setting and measurement end wavelength setting are changed.

5.1.3 [SPAN] switch

The related sweep functions have been grouped in the SPAN switch area

When this switch is pressed, the soft key menu shown in the following figure is displayed and the function of <SPAN> key is performed.



Soft key	Function
SPAN 1234.5 nm	Sets the span.
START WL 1234.56 nm	Sets the measurement start wavelength.
STOP WL 1234.56 nm	Sets the measurement end wavelength.
△λ→ SPAN	Searches the spectral width of the waveform and sets the obtained value in the span.
0 nm SWEEP TIME 50s	Sets the time required for measurement from the left end to the right end of the screen at the 0 nm sweep.

(1) <SPAN> key

Sets the span.

The allowable setting range is 0 and 1.0 to 1500.0 nm (0.1 step) and the rotary knob, step keys or ten-key pad is used for setting.

When the setting has been changed, waveform rewrite processing is performed. Measurement start wavelength setting and measurement end wavelength setting are also changed at the same time.

(2) <START WL> key

Sets the measurement start wavelength.

When this key is pressed, the current measurement start wavelength is displayed in the interrupt display section.

The allowable setting range is –400.00 to 1750.00 nm (0.01 step) and the rotary knob, step keys or ten-key pad is used for setting.

When the setting has been changed, waveform rewrite processing is performed.

(3) <STOP WL> key

Sets the measurement end wavelength.

When this key is pressed, the current measurement end wavelength is displayed in the interrupt display section.

The allowable setting range is 350.00 to 2500.00 nm (0.01 step) and the rotary knob, step keys or ten-key pad is used for setting.

When the setting has been changed, waveform rewrite processing is performed.

When setting the measurement start wavelength, the measurement end wavelength is fixed.
When setting the measurement end wavelength, the measurement start wavelength is fixed.
Therefore, sweep width setting is changed. Mean wavelength setting is also changed at the same time.
When the ten-key pad is used for setting, the settable nearest value is set.

(4) <Δλ→ SPAN> key

Executes a spectral width search for active trace internally and sets the obtained value in the center wavelength and the span.

The spectral width search is made at an RMS of 20 dB and a magnification of 6.00.

After execution, the set span is displayed in the interrupt display section, and the displayed waveform is rewritten according to the set center wavelength and span.

Span setting can be performed in succession by using the rotary knob, step keys or ten-key pad, and the allowable setting range is 0 and 1.0 to 1500.0 nm (0.1 step).

The center wavelength span, measurement start wavelength and measurement end wavelength are changed through execution of this key.

(5) <0 nm SWEEP TIME> key

Sets the time required for measurement from the left end to the right end of the screen for a sweep when the span is 0 nm.

At this time, the sampling count is 1001 points.

When this key is pressed, the current sweep time is displayed in the interrupt display section.

The allowable setting range is MINIMUM and 1 to 50 sec (1 step) and the rotary knob, step keys or ten-key pad is used for setting.

NOTE

"UNCAL" Display

When the resolution is too small for the sampling intervals determined by the set span and the set number of samples, there is a possibility that data may not be collected perfectly.
In this equipment, when the span, number of samples and resolution are improperly set, "UNCAL" is displayed in the vicinity of the resolution display on the waveform frame.
In the status where "UNCAL" is displayed, correct measurement cannot be made.
At that time, reduce the span or increase the number of samples or resolution before measurement so that "UNCAL" may not be displayed.

5.1.4 [LEVEL] switch

The related level axis setup functions have been grouped in the LEVEL switch area.
When this switch is pressed, the soft key menu shown in the following figure is displayed and the function of <REF LEVEL> key is performed.

①

REF LEVEL −20.00 dBm	Sets the reference level.
LOG SCALE **.* dB/D	Switches the level axis to the LOG display.
LIN SCALE	Switches the level axis to the linear display.
BASE LVL **.* mW	Sets the lower scale limit in linear scale display.
PEAK→ REF LEVEL	Saves peak level of waveform internally and sets obtained value in the reference level.
AUTO REF LEVEL	Sets the peak level in the reference level at each sweep (Toggle)
dBm dBm/nm	Switches the power indication. dBm : Power in a single resolution dBm/nm : Power in 1 nm
MORE 1/2	Displays the soft key menu of 2/2 (to ②).
△ LEVEL	

②

SUB LOG **.* dB/D	Sets the subscale in the LOG mode.
SUB LIN *.*** /D	Sets the subscale in the linear mode.
SUB SCALE **.* dB/k	Sets the subscale in dB/km mode.
SUB SCALE **.* %/D	Sets the subscale in % level scale mode.
OFST LVL **.* dB	Sets offset level of the scale while the subscale is being displayed.
LENGTH **.*** km	Sets an optical fiber length.
AUTO SUB SCALE	Displays the subscale by automatic scaling.
MORE 2/2	Displays the soft key menu of 1/2 (to ①).
△ LEVEL	

(1) <REF LEVEL> key

Sets the reference level.

Unit switches between "dBm" and "*W" depending on in which of the LOG or linear the level scale is displayed. Also, there is difference in display position of the reference level between the LOG scale and the linear scale (See following page).

Allowable setting range in the LOG scale mode is –90 to +20.0 dBm (0.1 step). This setting is done with the rotary knob, step keys or ten-key.

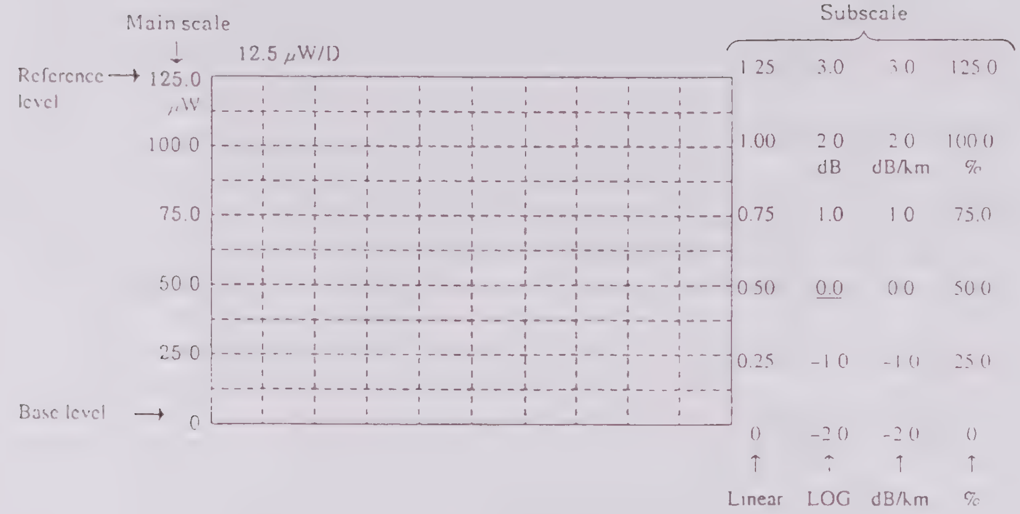
Allowable setting range in the linear scale mode is 1.00 pW to 100 mW (1.00 to 9.99 [pW, nW, μW, mW]:0.01 step, 10.0 to 99.9 (100) [pW, nW, μW, (mW)]:0.1 step, 100 to 999 [pW, nW, μW]:1 step). This setting is done with the rotary knob, step keys or ten-key. When ten-key is used for setting, the soft key menu ③ used for selecting the unit (pW, nW, μW, mW) appears upon pressing ten-key.

Enter value and press the soft key corresponding to the desired unit.

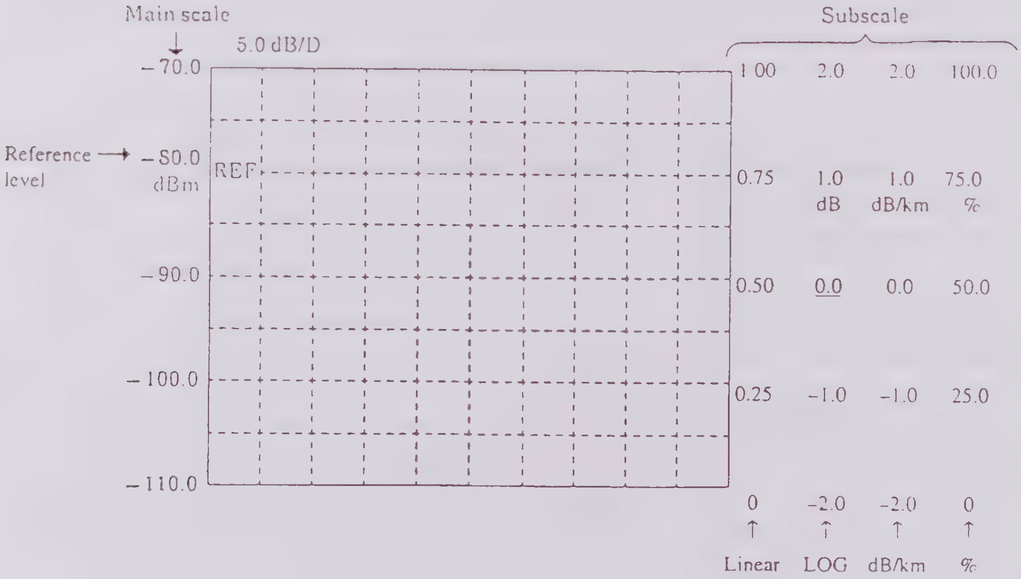
If [ENTER] of ten-key is pressed instead of unit key of the soft key, setting is performed using currently set unit. When a change such as 999 → 1.00 or 1.00 → 999 is done, change of unit also takes place. (Example: pW → nW or nW → pW.)

When the reference level in the LOG mode or linear mode is changed, waveform being displayed is rewritten according to the reference level after change.

- When the main scale is in the linear scale (10 DIV)



- When the main scale is in the LOG scale (8 DIV)



(2) <LOG SCALE **.* dB/D> key

Switches the level axis to the LOG display and sets the level scale.

When this key is pressed, the level axis is set in the LOG scale and, at the same time, current set value is displayed in the interrupt display section.

Allowable setting range is 0.1 to 10.0 dB/DIV (0.1 step). Setting is done with the rotary knob, step keys or ten-key.

When the setting is changed, waveform being displayed is rewritten according to the level axis after change.

If setting is done to a scale equal to or larger than 5 dB/DIV in the range fixed mode (SENS:NORMAL RANGE HOLD) or pulse light measurement mode, WARNING will appear because accurate measurement of top and bottom of the waveform is impossible.

(→ 10.3.5 Valid range of level axis when the measurement sensitivity is set in NORMAL RANGE HOLD.)

(3) <LIN SCALE> key

Sets the main scale in the linear scale.

Setting per 1DIV is done in the reference level.

(4) <BASE LVL**.*mW> key

Sets the lower limit of the level scale if the liner level axis scale is used.

This setup is invalid in the LOG scale mode.

The allowable setting range is 0 to REF level multiplied by 0.9. Only the same unit set in the REF level is valid.

If the setup is changed, the on-screen waveforms are redrawn according to the level axis after change.

The scale of the left upper end waveforms is 1/10 (*mW) of the REF (reference) level subtracted by the base level.

(5) <PEAK → REF LEVEL> key

Searches peak level processing for active trace internally and sets the obtained value in the reference value.

After execution, the set reference level (peak level value) is displayed in the interrupt display section and rewrite processing is performed for the displayed waveform according to the reference level after the change.

The rotary knob, step keys or ten-key pad can be used for setting the reference level in succession.

Allowable range of change in the LOG mode scale is –90.0 to +20.0 dBm (0.1 step) and that in the linear scale mode is 1.00 pW to 100 mW (1.00 to 9.999 [pW, nW, μW, mW] :0.01 step, 100 to 99.9 (100) [pW, nW, μW (mW)]:0.1 step, 100 to 999 [pW, nW, μW]:1 step).

If the peak level value exceeds the allowable setting range, it is set to the nearest value within the range and WARNING is displayed.

(6) <AUTO REF LEVEL> key

Sets the ON/OFF status of the PEAK → REF LEVEL function to be performed at each sweep.
When this key is selected, the peak level is searched from the active trace waveforms automatically during each sweep and the peak level is set to the reference level.
This function is disabled while the active trace is in the MAX HOLD, MIN. HOLD, CALC, EFFECT or ROLL AVG status.

In the reverse video status, AUT REF is displayed at the bottom of the screen.

(7) <dBm dBm/nm> key

Switches the level axis scale display between "dBm" (mW, μW, nW or pW in Linear Scale mode) and "dB/nm" (mW/nm, μW/nm, nW/nm or pW/nm in Linear Scale mode).

dBm : Power in a single resolution
dB/nm : Power in 1 nm

Refer to Item 5.2.6. for usage of dBm and dB/nm.

(8) <SUB LOG> key

Sets the subscale in the LOG scale.
When this key is pressed, the current set value is displayed in the interrupt display section.
The allowable setting range is shown below and the rotary knob, step keys or ten-key pad is used for setting.

0.1 to 10.0 dB/DIV (0.1 step):

When the setting has been changed, rewrite processing is performed for the display waveform according to the scale after the change.

(9) <SUB LIN> key

Sets the subscale in the linear scale.
When this key is pressed, the current set value is displayed in the interrupt display section.
The allowable setting range is shown below and the rotary knob, step keys or ten-key pad is used for setting.

0.005 to 1.250/DIV (0.005 step): Upon execution of A/B or B/A

When the setting has been changed, rewrite processing is performed for the display waveform according to the scale after the change.

(10) <SUB SCALE **.*dB/km> key

Sets the subscale in dB/km.
When this key is pressed, the current set value is displayed in the interrupt display section.
The allowable setting range is 0.1 to 10.0 dB/km (at 0.1 step), and it can be set by the rotary knob, step keys, or numeric keys.
If the setup is changed, the on-screen waveforms are redrawn according to the scale after change.

(11) <SUB SCALE ***.*%/D> key

Sets the subscale in percentage (%).

When this key is pressed, the current set value is displayed in the interrupt display section.

The allowable setting range is 0.5 to 125.0%/D (at 0.1 step), and it can be set by the rotary knob, step keys, or numeric keys.

If the setup is changed, the on-screen waveforms are redrawn according to the scale after change.

(12) <OFST LVL> and <SCALE MIN> keys

When the subscale is in the "dB/m" or "dB/km" mode, the <OFST LVL> key set an offset.

During "dB/D" mode, the allowable setting range is 0 to ±99.9 dB (at 0.1 step). During "dB/km" mode, the allowable setting range is 0 to ±99.9 dB/km (at 0.1 step). They can be set by the rotary knob, step keys, or numeric keys.

When the subscale is in the "LIN" or "%" mode, the <SCALE MIN> key sets the scale lower limit value.

During "LIN" mode, the allowable setting range is 0 to the subscale value (**.*/D) multiplied by 10.

During "%" mode, the allowable setting range is 0 to the subscale value (***.*%/D) multiplied by 10.

They can be set by the rotary knob, step keys, or numeric keys.

(13) <LENGTH **.***km> key

Sets an optical fiber length.

The allowable setting range is 0.001 to 99.999 km (at 0.001 step), and it can be set by the rotary knob, step keys, or numeric keys.

(14) <AUTO SUB SCALE> key

Sets the ON/OFF status of the function to display the subscale by automatic scaling after arithmetic operations when the trace C is set at <CALCULATE C> or <EFFECT C>.

When this key is selected, rewrite processing is performed for the displayed waveform according to the level axis scale after the change. SUB LOG, SUB LIN or OFST LVL are changed by automatic scaling.

In the reverse video status, AUT SCL is displayed at the bottom of the screen.

NOTE

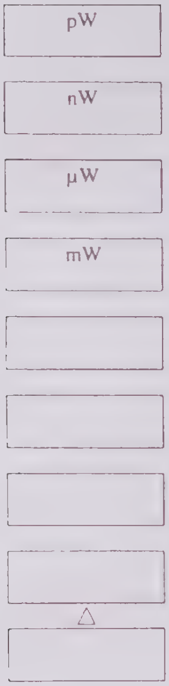
What is the subscale ?

When the differential waveforms (based on LOG value), normalized waveforms, or luminosity correction waveforms are displayed, the absolute value is shown on the level scale. On this equipment, the relative level scale is called the "subscale".

When both the waveforms of absolute and relative values are overlapped, the absolute value scale is shown at left and the relative value scale is shown at right.

If the left scale (main scale) is switched to the LOG (8 DIV) or linear (10 DIV), the subscale is shown according to number of DIV of the main scale.

③



pW .... In the linear scale, unit is specified to "pW" after the reference level has been entered using ten-key.

nW .... In the linear scale, unit is specified to "nW" after the reference level has been entered using ten-key.

µW .... In the linear scale, unit is specified to "µW" after the reference level has been entered using ten-key.

mW .... In the linear scale, unit is specified to "mW" after the reference level has been entered using ten-key.

(15) <pW> key

Specifies unit of reference level to "pW" in the linear scale.
This soft key menu ③ can be shown by pressing ten-key while the screen is in the linear scale mode (this state is brought up by selecting <LIN SCALE>) and displaying interrupt of the reference level.
If this key is pressed following entry of value, scale is set and, at the same time, the soft key menu disappears and the screen returns to the state at the time when ten-key was pressed.

(16) <nW> key

Specifies unit of the reference level to "nW" in the linear scale.
This soft key menu ③ can be shown by pressing ten-key while the screen is in the linear scale mode (this state is brought up by selecting <LIN SCALE>) and displaying interrupt of the reference level.
If this key is pressed following entry of value, scale is set and, at the same time, the soft key menu disappears and the screen returns to the state at the time when ten-key was pressed.

(17) <µW> key

Specifies unit of the reference level to "µW" in the linear scale.
This soft key menu ③ can be shown by pressing ten-key while the screen is in the linear scale mode (this state is brought up by selecting <LIN SCALE>) and displaying interrupt of the reference level.
If this key is pressed following entry of value, scale is set and, at the same time, the soft key menu disappears and the screen returns to the state at the time when ten-key was pressed.

(18) <mW> key

Specifies unit of the reference level to "mW" in the linear scale.

This soft key menu ③ can be shown by pressing ten-key while the screen is in the linear scale mode (this state is brought up by selecting <LIN SCALE>) and displaying interrupt of the reference level.

If this key is pressed following entry of value, scale is set and, at the same time, the soft key menu disappears and the screen returns to the state at the time when ten-key was pressed.

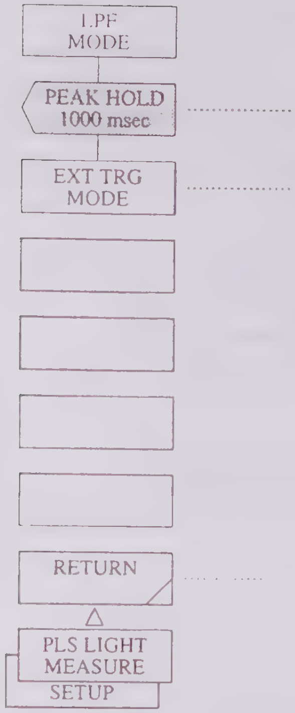
5.1.5 [SETUP] switch

The relative measuring condition setup functions have been grouped in the SETUP switch area.
When this switch is pressed, the soft key menu of ① is displayed.

①

RESOLN 0.05 nm	Sets the resolution.
SENS NORM RANG HOLD	Sets the measuring sensitivity.
AVERAGE TIMES 1	Sets the number of averaging times.
SAMPLING PT 1001	Sets the sampling point for measurement.
CW LIGHT MEASURE	Sets the CW light measurement mode.
PLS LIGHT MEASURE	Sets the pulse light measurement mode. (To ②)
MONOCHRO SGL DBL	Selects single or double for the monochrometer. (Toggle)
CHOP INT EXT	Selects internal or external for chopping operation. (Toggle)
△ SETUP	

②



Sets LPF measurement mode for the pulsed light.

Sets the peak hold measurement mode for pulsed light.

Sets the external trigger signal measurement mode for pulsed light

Returns to the soft key menu of ①

(1) <RESOLN> key

Sets the resolution.

When this key is pressed, the current resolution is displayed in the interrupt display section.

The allowable setting range is 0.05 to 10 nm (1, 2 or 5 steps) and the rotary knob, step keys or ten-key pad is used for setting.

NOTE

When an optical fiber with large-diameter cores is used, the maximum resolution is restricted, so that the set resolution may not be obtained.
(→ 10.3.3 Restriction on resolution)

(2) <SENS> key

Sets the measuring sensitivity.

This equipment permits selecting 5 measuring sensitivity levels according to the use.

When this key is pressed, the current measuring sensitivity is displayed in the interrupt display section.

The allowable setting range is NORMAL RANGE HOLD, NORMAL RANGE AUTO, HIGH 1, HIGH 2 and HIGH 3. The display is changed in rotation by the rotary knob or step keys as "NORMAL RANGE HOLD", "NORMAL RANGE AUTO", "HIGH 1", "HIGH 2" and "HIGH 3" in order to select a desired sensitivity level. (→8.1.3 Measuring sensitivity selection)

(3) <AVERAGE TIME> key

Sets the number of averaging times for each measurement point.

When this key is pressed, the current number of averaging times is displayed in the interrupt display section.

The allowable setting range is 1 to 1000 times (1 step) and the rotary knob, step keys or ten-key pad is used for setting.

NOTE

> *If the number of averaging times is large (e.g., 1000 times) at a measuring sensitivity level of HIGH 1 to 3, the time required for sweeps becomes extremely long.*

(4) <SAMPLING PT> key

Sets the sampling point for one sweep.

When this key is pressed, the current sampling count is displayed in the interrupt display section.

The allowable setting range is 11 to 1001 points (1 step) and the rotary knob, step keys or ten-key pad is used for setting.

Usually, this mode is used for measurement.

NOTE

> *"UNCAL" Display*
>
> *When the resolution is too small for the sampling intervals determined by the set span and the set number of samples, there is a possibility that data may not be collected perfectly.*
> *In this equipment, when the span, number of samples and resolution are improperly set, "UNCAL" is displayed in the vicinity of the resolution display on the waveform frame.*
> *In the status where "UNCAL" is displayed, correct measurement cannot be made.*
> *At that time, reduce the span or increase the number of samples or resolution before measurement so that "UNCAL" may not be displayed.*

(5) <CW LIGHT MEASURE> key

Sets the CW light measurement mode.

In this mode, every measuring sensitivity can be set.

(6) <PLS LIGHT MEASURE>

Sets the pulse light measurement mode. (→ 5.2.1 Pulse light measuring function)

When this key is pressed, it is displayed in reverse video and the soft key menu of ② is displayed.

If the <PEAK HOLD> key is displayed in reverse video in the soft key menu of ②, the current hold time is displayed in the interrupt display section.

In this mode, the measuring sensitivity can not be changed.

(7) <MONOCHRO SGL DBL> key

Sets whether the monochrometer is to be used in the single or double mode. Each time this key is pressed, SGL or DBL is selected alternately.
In the "SGL" status, single monochrometer is selected.
In the "DBL" status, double monochrometer is selected.

(8) <CHOP INT EXT> key

Sets whether the chopping operation is to be performed internally or externally at the Sensitivity High 1 to 3.
Each time this key is pressed, INT or EXT is selected alternately. (→ 5.2.2 External chop function)
In the "INT" status, turn the internal chopper. At the "EXT" status, stop the shopper for measurement.
Usually select "INT".

In the "EXT" status, EXT CHP is displayed at the bottom of the screen.

(9) <LPF MODE> key

Sets the mode for measuring pulse light by using a Low Pass Filter. (→ 5.2.1 Pulse light measuring function)
When this key is pressed, it is displayed in reverse video and LPF mode is entered.

(10) <PEAK HOLD> key

Sets the mode for measuring the peak level of pulse light. (→ 5.2.1 Pulse light measuring function)
When this key is pressed, it is displayed in reverse video and PEAK HOLD mode is entered.
The hold time is shown in the interrupt display area.
It can be set within the range of 1 msec to 9999 msec using the rotary knob, step keys or ten keys.

(11) <EXT TRG MODE> key

Sets the mode for measuring pulse light by external trigger signal. (→ 5.2.1 Pulse light measuring function)
When this key is pressed, it is desplayed in reverse video and external trigger mode is entered.

(12) <RETURN> key

Returns to the soft key menu of ①.

5.1.6 [MARKER] switch

This switch performs the setting related to the marker function.
When this switch is pressed, the soft key menu of ① is displayed.

NOTE

> *In the three-dimensional display mode, the waveforms displayed by the step keys can be selected by use of the marker. The parameters can be changed by the rotary control knob or numeric keys.*

①	MARKER	Displays the moving marker.
	MARKER→ CENTER	Sets the wavelength of the moving marker to the center wavelength
	MARKER→ REF LEVEL	Sets the level of the moving marker to the reference level.
	SET MARKER 1	Sets the moving marker to the fixed marker 1.
	SET MARKER 2	Sets the moving marker to the fixed marker 2.
	MARKER CLEAR	Clears the displayed moving marker and fixed marker.
	MKR UNIT nm THz	Sets whether the wavelength marker value is to be displayed in wavelength or frequency. (Toggle latch)
	MORE 1/2	Displays the soft key menu of 2/2.
	△ MARKER	

②

LINE MARKER 1	Displays the wavelength line marker 1.
LINE MARKER 2	Displays the wavelength line marker 2.
LINE MARKER 3	Displays the wavelength line marker 3.
LINE MARKER 4	Displays the wavelength line marker 4.
MKR L1-L2 →SPAN	Sets the section between the wavelength line markers 1 and 2 within the sweep range.
SEARCH L1-L2	Executes PEAK SEARCH and ANALYSIS between the wavelength line markers 1 and 2. (Toggle)
LINE MKR CLEAR	Clears all the displayed line markers and line marker values
MORE 2/2	Displays the soft key menu of 1/2
△	
MARKER	

(1) <MARKER> key

Displays the moving marker.

When no moving marker appears, it is displayed on the waveform in the center (point 501) of the screen and the marker value is displayed in the data area. If a moving marker already appears, it remains at the current displayed position without change.

After pressing this key, the moving marker can be moved by the rotary knob or step keys.

(2) <MARKER → CENTER> key

Sets the wavelength of the moving marker to the center wavelength and performs waveform rewrite processing.

After execution, the set mean wavelength is displayed in the interrupt display section. At this time, center wavelength setting, measurement start wavelength setting and measurement end wavelength setting are changed.

Center wavelength setting can be performed in succession by using the rotary knob, step keys or ten-key pad.

The allowable setting range is 350.00 to 1750.00 nm (0.01 step).

(3) <MARKER → REF LEVEL> key

Sets the level of the moving marker to the reference level.
After execution, the set reference level is displayed in the interrupt display section and rewrite processing is performed for the displayed waveform according to the reference level after the change.
Reference level setting can be performed in succession by using the rotary knob, step keys or ten-key pad.
Allowable range of change in the LOG scale is –90.0 to +20.0 dBm (0.1 step) and that in the linear scale is 1.00 pW to 100 mW (1.00 to 9.99 [pW, nW, μW, mW]:0.01 step, 10.0 to 99.9 (100) [pW, nW, μW, (mW)]:0.1 step, 100 to 999[pW, nW, μW]:1 step).

If the moving marker value exceeds the allowable setting range, it is set to the nearest value in the range and WARNING is displayed.

(4) <SET MARKER 1> key

Sets the fixed marker 1 to the moving marker and displays the marker value in the data area.
After fixing, the moving marker can be moved by the rotary knob or step keys.

(5) <SET MARKER 2> key

Sets the fixed marker 2 to the moving marker and displays the marker value in the data area.
After fixing, the moving marker can be moved by the rotary knob or step keys.

(6) <MARKER CLEAR> key

Clears the displayed moving marker and fixed marker and also the marker value in the data area.

(7) <MKR UNIT nm THz> key

Sets whether the unit of wavelength marker value is to be nm (wavelength) or THz (frequency).
The selected soft key character is displayed in reverse video.

(8) <LINE MARKER 1> key

Displays the wavelength line marker 1.
While the moving marker is displayed, the wavelength line marker 1 is displayed at the position of the moving marker. When the moving marker is not displayed, the wavelength line marker 1 is displayed at the 1/4 position from the left end of the screen.
When the wavelength line marker 1 already appears, it remains at the displayed position without change.
After execution, the wavelength line marker 1 can be moved by the rotary knob or step keys.

(9) <LINE MARKER 2> key

Displays the wavelength line marker 2.
While the moving marker is displayed, the wavelength line marker 2 is displayed the position of the moving marker. When the moving marker is not displayed, the wavelength line marker 2 is displayed at the 1/4 position from the right end of the screen.
When the wavelength line marker 2 already appears, it remains at the displayed position without change.
After execution, the wavelength line marker 2 can be moved by the rotary knob or step keys.

(10) <LINE MARKER 3> key

Displays the level line marker 3.

While the moving marker is displayed, the level line marker 3 is displayed at the 1/4 from the upper end of the screen. When the level line marker 3 already appears, it remains at the displayed position without change.

After execution, the level line marker 3 can be moved by the rotary knob or step keys.

(11) <LINE MARKER 4> key

Displays the level line marker 4.

While the moving marker is displayed, the level line marker 4 is displayed at the position of the moving marker. When the moving marker is not displayed, the level line marker 4 is displayed at the 1/4 position from the lower end of the screen.

When the level line marker 4 already appears, it remains at the displayed position without change

After execution, the level line marker 4 can be moved by the rotary knob or step keys.

(12) <MKR L1-L2 → SPAN> key

Sets the section between the wavelength line markers 1 and 2 within the sweep range and performs rewrite processing.

After execution, the set span is displayed in the interrupt display section. When a span change is made, the displayed waveform is rewritten according to the set span.

Span setting can be performed in succession by using the rotary knob, step keys or ten-key pad

The allowable setting range is 0 and 1.0 to 1500.0 nm (0.1 step).

Span setting, measurement start wavelength setting and measurement end wavelength setting can be changed by executing this key.

NOTE

When both WL1 and WL2 are set, set the smaller value to the measurement start wavelength and the larger value to the measurement end wavelength.
When only WL1 is set, set the marker value to the measurement start wavelength and the right end of the screen to the measurement end wavelength.
When only WL2 is set, set the left end of the screen to the measurement start wavelength and the marker value to the measurement end wavelength.

(13) <SEARCH L1-L2> key

When this key is selected and the wavelength line markers 1 and 2 are set, PEAK SEARCH or ANALYSIS is executed between the markers 1 and 2.

When this key is not selected, it is executed within the effective range of the screen.

NOTE

> *When both WL1 and WL2 are set, it is executed between the line marker 1 and 2.*
> *When only WL1 is set, it is executed between the line marker 1 and the right end of the screen.*
> *When only WL2 is set, it is executed between the left end of the screen and the line marker 2.*
> *When WL1 and WL2 are not set, it is executed for all range of the screen.*

In the reverse video status, SRC 1-2 is displayed at the bottom of the screen.

(14) <LINE MKR CLEAR> key
Clears all the displayed line markers and line marker values.

5.1.7 [PEAK SEARCH] switch

When this switch is pressed, the soft key menu of ① is displayed and the <PEAK SEARCH> key or <BOTTOM SEARCH> key that is selected is executed.

1	PEAK SEARCH	Detects the maximum value of level and sets the moving marker.
	BOTTOM SEARCH	Detects the minimum value of level and sets the moving marker.
	NEXT SEARCH	Detects the next maximum value/minimum value and sets the moving marker.
	NEXT SRCH RIGHT	Sets the moving marker to the right-hand next maximum value/minimum value.
	NEXT SRCH LEFT	Sets the moving marker to the left-hand next maximum value/minimum value.
	SET MARKER 1	Sets the moving marker to the fixed marker 1.
	SET MARKER 2	Sets the moving marker to the fixed marker 2.
	MORE 1/2	Displays the soft key menu of 2/2.
	△	
	PEAK SRCH	

②

MARKER CLEAR	Clears the displayed moving marker and fixed marker.
AUTO SEARCH	Detects the maximum value/minimum value of level at each sweep. (Toggle)
MODE DIFF 3.00 dB	Sets the peak/bottom difference that becomes a criterion for mode judgment.
MORE 2/2	Displays the soft key menu of 1/2.
△	
PEAK SRCH	

(1) <PEAK SEARCH> key

Makes a peak search (detection of the maximum value of level) for the active trace, sets the moving marker and displays the marker value in the data area. When the peak level exceeds the upper end or lower end of the screen, the marker is displayed at the upper end or lower end, and the marker value is displayed correctly.

After execution, the marker can be moved by the rotary knob or step keys.

(2) <BOTTOM SEARCH> key

Makes a bottom search (detection of the minimum value of level) for the active trace, sets the moving marker, and displays the marker value in the data area. When the bottom level exceeds the upper end or lower end of the screen, the marker is displayed at the upper end or lower end, and the marker value is displayed correctly.

After execution, the marker can be moved by the rotary knob or step keys.

(3) <NEXT SEARCH> key

Sets the moving marker to the peak (maximum value of level) or bottom (minimum value of level) next to the current set moving marker value (level value) on the active trace. When such a peak or bottom does not exist, the moving marker is continuously displayed at the same position.

When the peak or bottom exceeds the upper end or lower end, the marker value is displayed correctly.

(4) <NEXT SRCH RIGHT> key

Sets the moving marker to the peak (maximum value of level) or bottom (minimum value of level) on the right of the current set moving marker value (level value) on the active trace. When such a peak or bottom does not exist, the moving marker is continuously displayed at the same position.
When the peak or bottom exceeds the upper end or lower end of the screen, the marker value is displayed correctly.

(5) <NEXT SRCH LEFT> key

Sets the moving marker to the peak (maximum value of level) or bottom (minimum value of level) on the left of the current set moving marker value (level value) on the active trace. When such a peak or bottom does not exist, the moving marker is continuously displayed at the same position.
When the peak or bottom exceeds the upper end or lower end of the screen, the marker value is displayed correctly.

(6) <SET MARKER 1> key

Sets the fixed marker 1 to the moving marker 1 and displays the marker value in the data area.
After fixing, the moving marker can be moved by the rotary knob or step keys.

(7) <SET MARKER 2> key

Sets the fixed marker 2 to the moving marker 2 and displays the marker value in the data area.
After fixing, the moving marker can be moved by the rotary knob or step keys.

(8) <MARKER CLEAR> key

Clears the displayed moving marker and fixed marker and also the marker value in the data area.

(9) <AUTO SEARCH> key

Sets the ON/OFF status of the peak/bottom function at each sweep. When this key is selected, a peak/bottom search is automatically made after completion of the sweep, and the moving marker is set.

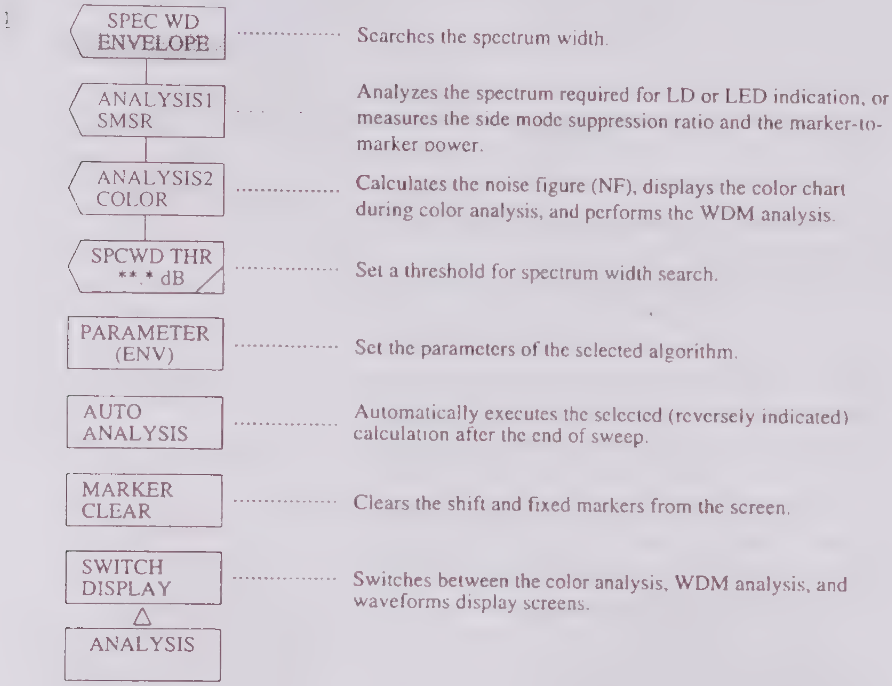
In the reverse video status, AUT SRC is displayed at the bottom of the screen.

(10) <MODE DIFF> key

Sets the minimum difference (dB) between the top and bottom points of waveforms to be used as the mode selection reference when a mode is selected by <PEAK SEARCH> or <ANALYSIS> key.
When this key is pressed, the current set value is displayed in the interrupt display section.
The allowable setting range is 0 to 50.00 dB (0.01 step) and the rotary knob, step keys or ten-key pad is used for setting.

5.1.8 [ANALYSIS] switch

The related spectrum analysis functions have been grouped in this ANALYSIS switch area.
When this switch is pressed, the soft key menu of ① is displayed, and also a selected key among the first 3 keys from the top is executed.



SPEC WD ENVELOPE	Searches the spectrum width.
ANALYSIS1 SMSR	Analyzes the spectrum required for LD or LED indication, or measures the side mode suppression ratio and the marker-to-marker power.
ANALYSIS2 COLOR	Calculates the noise figure (NF), displays the color chart during color analysis, and performs the WDM analysis.
SPCWD THR **.* dB	Set a threshold for spectrum width search.
PARAMETER (ENV)	Set the parameters of the selected algorithm.
AUTO ANALYSIS	Automatically executes the selected (reversely indicated) calculation after the end of sweep.
MARKER CLEAR	Clears the shift and fixed markers from the screen.
SWITCH DISPLAY	Switches between the color analysis, WDM analysis, and waveforms display screens.

(1) <SPEC WD ******> key

Measures the spectrum width.

When this key is pressed, the algorithm is displayed on the screen. Also, the spectrum width is measured based on the selected algorithm, the exclusive marker is set, and the spectrum width is displayed in the data area.

The following algorithm parameters can be set by the rotary knob or step keys:

Parameters: ENVELOPE, THRESH, RMS, PEAK RMS, NOTCH

(1)-1 <SPEC WD ENVELOPE> key

Displays the spectral width by the envelope method on active trace.

Also, this key sets the dedicate marker.

The threshold can be set by the <SPCWD THR **.*dB> key. The other parameters can be set from the soft key menu which is displayed when the <PARAMETER(*******)> key is pressed.

When there is no data on the active trace, WARNING is displayed.

For the algorithm using the envelope method, refer to 5.4.1.

(1)-2 <SPEC WD THRESH> key

Displays the spectral width by the threshold method on active trace.

Also, this key sets the exclusive marker.

The threshold can be set by the <SPCWD THR **.*dB> key. The other parameters can be set from the soft key menu which is displayed when the <PARAMETER(*******)> key is pressed.

When there is no data on active trace, WARNING is displayed.

For the algorithm using the threshold method, refer to 5. 4. 2.

(1)-3 <SPEC WD RMS> key

Displays the spectral width by the RMS method on active trace.

Also, this key sets the exclusive marker.

The threshold can be set by the <SPCWD THR **.*dB> key. The other parameters can be set from the soft key menu which is displayed when the <PARAMETER(*******)> key is pressed.

When there is no data on active trace, WARNING is displayed.

For the algorithm using the RMS method, refer to 5.4.3.

(1)-4 <SPEC WD PEAK RMS> key

Displays the spectral width by the PEAK RMS method on active trace.

Also, this key sets the exclusive marker.

When this key is selected, only the peak point of each mode exceeding the limit value on the displayed waveform is calculated.

The threshold can be set by the <SPCWD THR **.*dB> key. The other parameters can be set from the soft key menu which is displayed when the <PARAMETER(*******)> key is pressed.

When there is no data on active trace, WARNING is displayed.

For the algorithm using the PEAK RMS method, refer to 5.4.3.

(1)-5 <SPEC WD NOTCH> key

Measures the notch width of fiber grading transparent spectrum and others. For the notch width measurement algorithm, see Section 5.4.4.

The threshold can be set by the <SPCWD THR **.*dB> key. The other parameters can be set from the soft key menu which is displayed when the <PARAMETER(*******)> key is pressed.

(2) <ANALYSIS 1******> key

Measures the side-mode suppression ratio (SMSR) and the marker-to-marker power. Also, it can perform analysis required for LD and LED indication.

When this key is pressed, the analysis type is indicated displayed in the interrupt display area.

Also, the currently selected analysis is executed, the exclusive marker is set, and the measured results are displayed in the data area.

The following analysis parameters can be set using the rotary knob or step keys.

Parameters: SMSR, POWER, FL-LD, DFB-LD, LED

(2)-1 <ANALYSIS1 SMSR> key

Measures the side mode suppression ratio (SMSR) of the active trace, sets the moving marker and fixed marker 1 to the peak level of the waveform and the fixed marker 2 to the second highest level, and displays the result in the data area.

This function is mainly used for DFB laser measurement.

When there is no data on active trace, WARNING is displayed.

(2)-2 <ANALYSIS1 POWER> key

Makes a power measurement between markers for active trace.

When the <SEARCH L1-L2> key is displayed in reverse video, the integrated power enclosed by the wavelength line markers 1 and 2 is calculated and the level line marker 3 is set. Then, the integrated power value is displayed in the data area.

When the <SEARCH L1-L2> key is displayed in non-reverse video, power is calculated within the effective range of the screen.

When the <SEARCH L1-L2> key is displayed in reverse video and both wavelength line markers 1 and 2 are set out of the range, this is regarded as a no data status and WARNING is displayed.

The range for integration varies with the set status of the wavelength line markers.

Fig. 5-1 shows the range for integration at each setting by hatching.

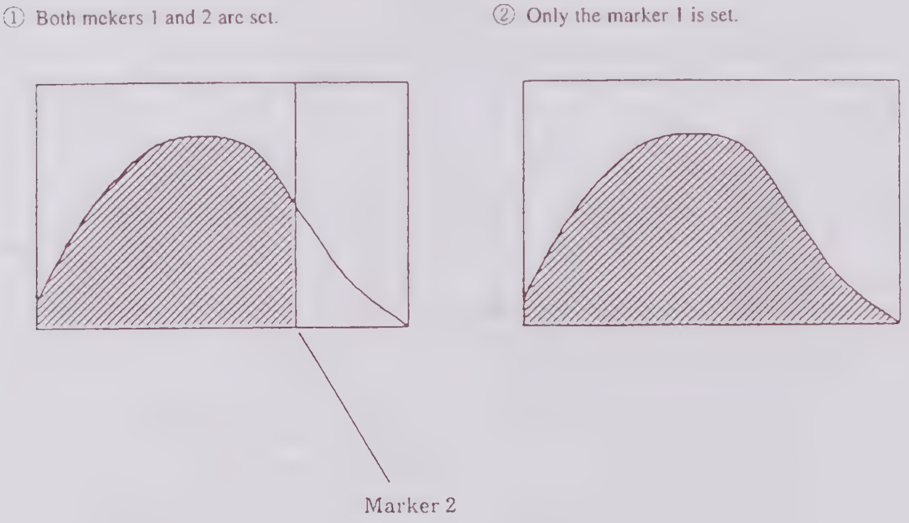
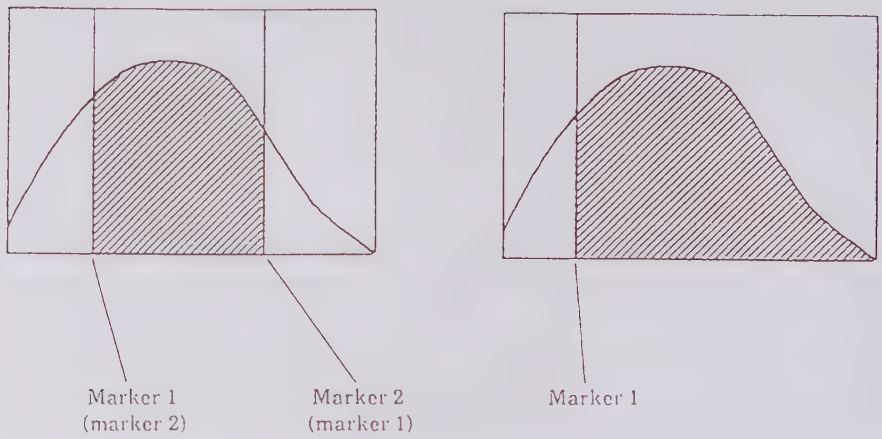


Fig. 5-1 Power Range Between Markers (1/2)



③ Only the marker 2 is set.

④ No marker is set.

Fig. 5-1 Power Range Between Markers (2/2)

Power measurement calculation is made by the following expression.

$$P = S \times \Sigma(\frac{Pi}{Ri})$$

In case of the A-B or B-A waveform:

$$P = S \times \Sigma Pi$$

P : Measured powervalue
S : Wavelength difference between display points [$\frac{SPAN}{1000}$]
Pi : Level at each point
Ri : Effective resolution value at the wavelength at each point

(2)-3 <ANALYSIS1 FP-LD> key

Makes an analysis required for FP-LD (Fabry-Perot laser diode) and displays the result in the data area for active trace. Regardless of the select status of the <SEARCH L1-L2> key, analysis is made for all the range of active trace.

The analysis items are as follows (Parameter can be set except for peak wavelength and peak level) :

- [MEAN WL]
- [MODE] (Mode number)
- [TOTAL POWER]
- [PK WL] (Peak wavelength)
- [PK LVL] (Peak level)
- [SPEC WD]

(2)-4 <ANALYSIS1 DFB-LD> key

Makes an analysis required for distributed feedback-laser diode (DFB-LD) and displays the result in the data area for active trace.

Regardless of the select status of the <SEARCH L1-L2> key, analysis is made for all the range of active trace.

The analysis items are as follows (Parameter can be set for SMSR and band width) :

- [SMSR] (Side-Mode Suppression Ratio)
- [MODE OFFSET] (space between a peak level and the next peak level)
- [PK WL] (Peak wavelength)
- [PK LVL] (Peak level)
- [−X dB WD]

(2)-5 <ANALYSIS1 LED> key

Makes an analysis required for LED (light emitting diodes and displays the result in the data area.

Regardless of the select status of the <SEARCH L1-L2> key, analysis is made for all the range of active trace.

When noise mask is set, the above measurement is made after completion of the noise mask.

The analysis items are as follows (Parameter can be set except for peak wavelength and peak level) :

- [MEAN WL]
- [TOTAL POWER]
- [PK WL] (Peak wavelength)
- [PK LVL] (Peak level)
- [SPEC WD]

(3) <ANALYSIS2 ******> key

Calculates the noise figure (NF). Also, this key performs the color analysis and WDM analysis.

When this key is pressed, the analysis type is indicated in the interrupt display area.

Also, the currently selected analysis is executed, the dedicate marker is set, and the measured results are displayed in the data area.

The following analysis parameters can be set using the rotary knob or step keys.

Parameters: COLOR, EDFA NF, WDM

(3)-1 <ANALYSIS2 COLOR> key

Analyzes the colors of active trace waveforms, and displays the color chart. Also, this key displays the measured results.

Regardless of the select status of the <SEARCH L1-L2> key, measurement is made for all the range of active trace.

The measurement items are as follows:

- Dominant wavelength
- The chromaticity coordinate values (X, Y, Z)

(3)-2 <ANALYSIS2 EDFA NF> key

Calculates NF (NOISE FIGURE) on the supposition that pre-amplification waveform and post-amplification waveform of the optical amplifier are put in the trace A and trace B and displays the result in the data area.

If the measurement conditions are different between the trace A and the trace B, WARNING is displayed.

For the NF measuring function, refer to 5.3.1.

(3)-3 <ANALYSIS2 WDM> key

Calculates the peak wavelength, peal level, and SNR of each channel of WDM waveforms.

Also, this key calculates the wavelength difference and level difference when any channel is selected.

The results are listed and displayed.

For the WDM analysis algorithm, see Section 5.3.3.

(4) <SPCWD THR **.*dB> key

Sets a threshold for spectrum width measurement.

When this key is pressed, the threshold is indicated in the interrupt display area. Also, the spectrum width is measured based on the current threshold, and the marker and data area are displayed.

The parameter corresponds to the TH or TH1 of each algorithm, and the parameters can be set for each algorithm.

The parameters can be set in the following range.

ENVELOPE : 0.1 to 10.0 dB (at 0.1 step)
THRESH : 0.1 to 50.0 dB (at 0.1 step)
RMS, PEAK RMS : 0.1 to 30.0 dB (at 0.1 step)

(5) <PARAMETER> key

Displays a soft key menu (soft key menus of ② to ⑧) for setting parameters for a selected key out of the above keys of (1) to (3)

A different soft key menu is displayed depending on the one out of 3 select status.

(6) <AUTO ANALYSIS> key

Sets the ON/OFF status of the ANALYSIS function to be executed at each sweep. When this key is selected, a selected key out of the above keys (1) to (3) is automatically executed after completion of the sweep.

If the <AUTO PEAK SEARCH> key is selected when this key is latched, the <AUTO PEAK SEARCH> key is cleared.

When the latch status of the <AUTO PEAK SEARCH> key is cleared by latching this key or when ANALYSIS cannot be executed upon completion of a sweep, WARNING is displayed.

In the reverse video status, AUT ANA is displayed at the bottom of the screen.

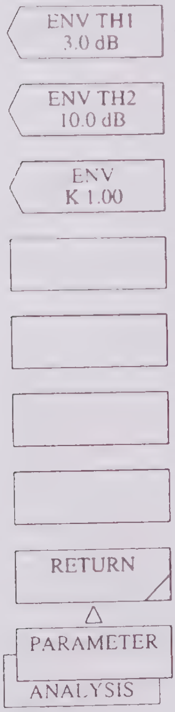
(7) <MARKER CLEAR> key

Clears the displayed moving marker and fixed marker and also the marker value in the data area.

(8) <SWITCH DISPLAY> key

Switches between the color chart displayed by the <ANALYSIS2 COLOR> key, the WDM list displayed by the <ANALYSIS2 WDM> key, and the waveforms screen.

This key is valid only when the <ANALYSIS2 COLOR> or <ANALYSIS2 WDM> key has been pressed.



ENV TH1 3.0 dB .... Sets the threshold value for searching the spectral width by the envelope method

ENV TH2 10.0 dB .... Sets the limit value for searching the spectral width by the envelope method.

ENV K 1.00 .... Sets the magnification for searching the spectral width by the envelope method.

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(9) <ENV TH1> key

Sets the threshold value for the spectral width search by the envelope method.

After execution, the current threshold value is displayed in the interrupt display section.

The threshold value can be changed in the range of 0.1 to 10.0 dB (0.1 step) by the rotary knob, step keys or ten-key pad.

(10) <ENV TH2> key

Sets the limit value for the spectral width search by the envelope method.

After execution, the current limit value is displayed in the interrupt display section.

The limit value can be changed in the range of 0.1 to 30.0 dB (0.1 step) by the rotary knob, step keys or ten-key pad.

(11) <ENV K> key

Sets the magnification for spectral width search by the envelope method.

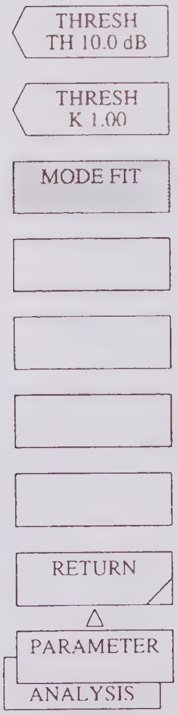
After execution, the current magnification is displayed in the interrupt display section.

The magnification can be changed in the range of 1.00 to 10.00 (0.01 step) by the rotary knob, step keys or ten-key pad.

(12) <RETURN> key

Returns the soft menu key of ANALYSIS ①.

③



THRESH TH 10.0 dB .... Sets the threshold value for searching the spectral width by the threshold method.

THRESH K 1.00 .... Sets the magnification for searching the spectral width by the threshold method.

MODE FIT .... Selects a marker position in searching the spectral width by the threshold method. (Toggle)

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(13) <THRESH TH> key

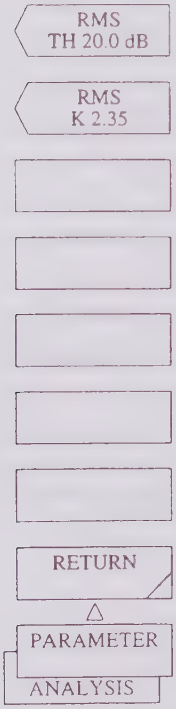
Sets the threshold value for the spectral width search by the threshold method.
After execution, the current threshold value is displayed in the interrupt display section.
The threshold value can be changed in the range of 0.1 to 50.0 dB (0.1 step).

(14) <THRESH K> key

Sets the magnification for the spectral width search by the threshold method.
After execution, the current magnification is displayed in the interrupt display section.
The magnification can be changed in the range of 1.00 to 10.00 (0.01 step) by the rotary knob, step keys or ten-key pad.

(15) <MODE FIT> key

Selects whether the marker is to be set to the mode peak or to the position where the level agrees with the threshold level when a spectral width search by the threshold method is executed (magnification K = 1).



RMS TH 20.0 dB .... Sets the limit value for the spectral width search by the RMS method.

RMS K 2.35 .... Sets the magnification for the spectral width search by the RMS method.

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(16) <RMS TH> key

Sets the limit value for the spectral width search by the RMS.

After execution, the current value is displayed in the interrupt display section.

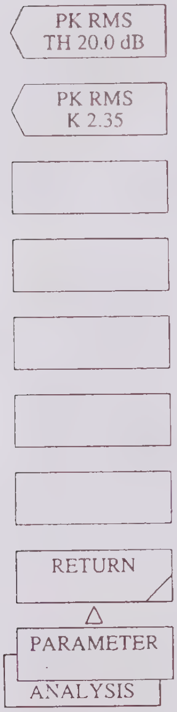
The limit value can be changed in the range of 0.1 to 30.0 dB (0.1 step) by the rotary knob, step key or ten-key pad.

(17) <RMS K> key

Sets the magnification for the spectral width search by the RMS method.

After execution, the current magnification is displayed in the interrupt display section. The magnification can be changed in the range of 1.00 to 10.00 (0.01 step) by the rotary knob, step keys or ten-key pad.

⑤



PK RMS TH 20.0 dB .... Sets the limit value for the spectral width search by the PEAK RMS method.

PK RMS K 2.35 .... Sets the magnification for the spectral width search by the PEAK RMS method.

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(18) <PK RMS TH> key

Sets the limit value for the spectral width search by the PEAK RMS method.

After execution, the current limit value is displayed in the interrupt display section.

The limit value can be changed in the range of 0.1 to 30.0 dB (0.1 step) by the rotary knob, step keys or ten-key pad.

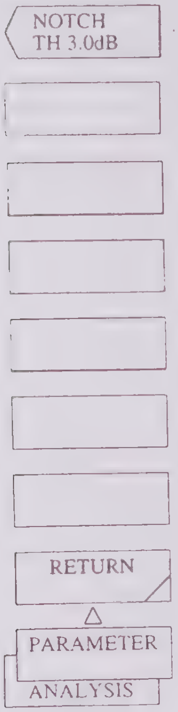
(19) <PK RMS K> key

Sets the magnification for the spectral width search by the PEAK RMS method.

After execution, the current magnification is displayed in the interrupt display section.

The magnification can be changed in the range of 1.00 to 10.0 (0.01 step) by the rotary knob, step keys or ten-key pad.

⑥



NOTCH TH 3.0dB .... Sets a threshold for notch width measurement.

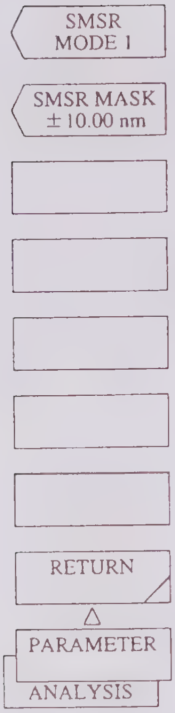
RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(20) <NOTCH TH> key

Sets a threshold for notch width measurement.

The threshold can be changed within the range of 0.1 to 50.0 dB (at 0.1 step) by the rotary knob, step keys, or numeric keys.

⑦



SMSR MODE 1 .... Sets the execution mode for SMSR measurement.

SMSR MASK ±10.00 nm .... Sets the mask range in the vicinity of the peak for SMSR1 measurement.

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

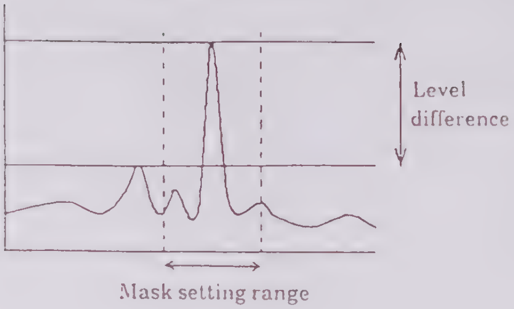
(21) <SMSR MODE> key

Sets the execution mode for SMSR measurement.
After execution, the current execution mode is displayed in the interrupt display section.
The execution mode can be set to 1 or 2 by the rotary knob, step keys or ten-key pad.
The following explains the "SMSR1" and "SMSR2" definition.

(22) <SMSR MASK> key

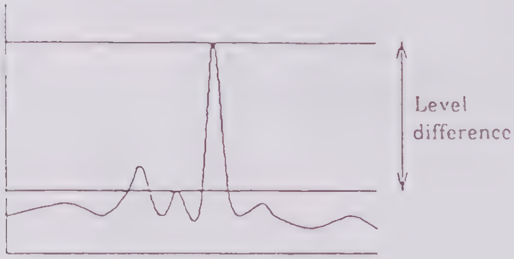
Sets the mask range in the vicinity of the peak for SMSR1 measurement.
After execution, the current mask range is displayed in the interrupt display section.
The mask range can be changed in the range of 0 to 99.99 nm (0.01 step) by the rotary knob, step keys or ten-key pad.

Definition of SMSR 1



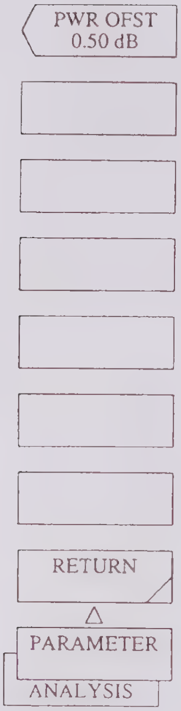
Determines the difference in level between the highest mode peak and the second highest mode peak (except mask setting range).

Definition of SMSR 1



Determines the difference in level between the highest mode peak and adjacent mode peaks whichever higher.

⑧



PWR OFST 0.50 dB .... Sets the compensation value for marker-to-marker power measurement.

RETURN .... Returns to the soft key menu of ANALYSIS. (To ①)

(23) <PWR OFSET> key

Sets the compensation value for power measurement.

After execution, the current compensation value is displayed in the interrupt display section. The compensation value can be changed in the range of –10.00 to 10.00 dB (0.01 step) by the rotary knob, step keys or ten-key pad.

(9)

CURSOR → ……………… Cursor on the window moves to → direction.

CURSOR ↓ ……………… Cursor on the window moves to ↓ direction.

RETURN ……………… Returns to the soft key menu of ANALYSIS. (To ①)

△

PARAMETER

ANALYSIS

(24) <PARAMETER (FP-LD)>, <PARAMETER (DFB-LD)>, <PARAMETER (LED)> keys

Displays parameter setting window.

When the window is displayed, cursor appears at top of "ALGO". When modifying parameters, move cursor to desired position with <CURSOR →> or <CURSOR ↓> and use the rotary knob, step keys or ten-key for the modification.

Window to be shown varies depending on which of <ANALYSIS1 FP-LD>, <ANALYSIS1 DFB-LD> and <ANALYSIS1 LED> key is pressed.

Following shows windows corresponding to each key.

- < ANALYSIS1 FP-LD>

ANALYSIS1 FP-LD							
ITEM	ALGO	TH [dB]	TH2 [dB]	K	MODE FIT	MODE DIFF [dB]	OFST LEVEL [dB]
SPEC WIDTH	PK RMS	20.0	–	2.00	–	3.00	–
MEAN WL	PK RMS	20.0	–	2.00	–	3.00	–
TOTAL POWER	POWER	–	–	–	–	–	0.00
MODE NO.	PK RMS	20.0	–	1.00	–	3.00	–

- <ANALYSIS1 DFB-LD>

ANALYSIS1 DFB-LD							
ITEM	ALGO	TH [dB]	TH2 [dB]	K	MODE FIT	MODE DIFF [dB]	SMSR MASK [nm]
--X dB WIDTH	THRESH	20.0	–	1.00	OFF	3.00	–
SMSR	SMSR1	–	–	–	–	3.00	±0.00

- < ANALYSIS1 LED>

ANALYSIS1 LED							
ITEM	ALGO	TH [dB]	TH2 [dB]	K	MODE FIT	MODE DIFF [dB]	OFST LEVEL [dB]
SPEC WIDTH	THRESH	3.0	–	1.00	OFF	3.00	–
MEAN WL	RMS	20.0	–	2.00	–	–	–
TOTAL POWER	POWER	–	–	–	–	–	0.00

- SPEC WIDTH (Spectral width)
  Specifies algorithm to be used in spectral measurement and also sets its parameters. (*)

- MEAN WL (Center wavelength)
  Specifies what algorithm is to be used in the spectral width measurement. λc obtained in that measurement is used as center wavelength. It also sets up parameter for the algorithm. (*)

- TOTAL POWER (Total power)
  Calculates the power measurement value just as done by <POWER> key. Here only correction values for power measurement is set because of parameters of <OFST LEVEL>. Refer to before mentioned (23) <PWR OFST> key for parameter setting.

- MODE NO. (Number of mode)
  Specifies algorithm is to be used in the spectral width measurement and also sets its parameters. "MODE" obtained in that measurement is used as number of mode. (*)

- –X dB WIDTH (Band width)
  Specifies algorithm to be used in the spectral width measurement and also sets its parameters. Δλ (spectral width) obtained in that measurement is used as band width. (*)

- SMSR (Side mode suppression ratio)
  Calculates side mode suppression ratio just as done by <SMSR> key. Specifies algorithm to be used and sets up its parameter.
  Refer to above mentioned (2)-1 for definition of algorithm and (22) and 5.1.7 (10) for parameter setting.

  (*) Following 4 types of algorithm are available for the spectrum width measurement.
  - *ENV (Envelope method)*
  - *THRESH (Threshold method)*
  - *RMS (RMS method)*
  - *PK RMS (Peak RMS method)*

  Refer to Section 5.4 for definition of algorithm and above mentioned (9) through (19) and 5.1.7 (10) for parameter setting.

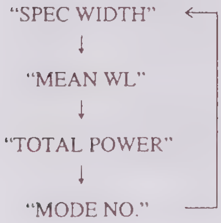
(25) <CURSOR →> key
Moves cursor shown in window to → direction.
Hold this key down to return it to its original position.

"ALGO" → "TH1" → "TH2" →"K" →"MODE FIT" →"MODE DIFF" →"OFST LEVEL"
↑

(26) <CURSOR ↓> key

Moves cursor shown in window to ↓ direction.
Hold this key down to return it to its original position.

(Example)



⑩

OFST (IN) ***. ** dB	Sets offset value of signal light.
OFST (OUT) ***. ** dB	Sets offset value of output light.
PLUS MSK **. ** nm	Specifies mask range in the right side of peak wavelength.
MINUS MSK **. ** nm	Specifies mask range in the left side of peak wavelength.
CVFT TYPE GAUSSIAN	Selects approximate expression of ASE curve.
CVFT THR **. * dB	Sets threshold which is used for approximating ASE curve.
RETURN	Returns to the soft key menu of ANALYSIS. (To ①)

EDFA NF
ANALYSIS

(27) <OFST (IN) ***.** dB> key

Press <EDFA NF> key for setting offset value of signal light (light which is entered to optical fiber amplifier) which is used in calculation of NF and gain.
When this key is executed, current offset value will be shown in the interrupt display section.
Offset value can be varied in the range of –99.99 to +99.99 dB (0.01 step) by use of the rotary knob, step keys or ten-key.

(28) <OFST (OUT) ***.**dB> key

Press <EDFA NF> key for setting offset value of output light (light being amplified through optical amplifier) which is used in calculation of NF and gain.

When this key is executed, current offset value will be shown in the interrupt display section.

Offset value can be varied in the range of −99.99 to +99.99 dB (0.01 step) by use of the rotary knob, step keys or ten-key.

(29) <PLUS MSK **.**nm> key

Specifies mask range on the right of peak wavelength when masking is done to signal light for calculating NF

When this key is executed, current mask value will be shown in the interrupt display section.

Mask range can be varied in the range of 0 to 10.00 nm (0.01 step) by use of the rotary knob, step keys or ten-key

(30) <MINUS MSK **.***nm> key

Specifies mask range on the left side of peak wavelength when masking is done to signal light for calculating NF.

When this key is executed, current mask value will be shown in the interrupt display section.

Offset value can be varied in the range of 0 to 10.00 nm (0.01 step) by use of the rotary knob, step keys or ten-key.

(31) <CVFT TYPE> key

Selects type of curve fit (approximation expression) for calculating NF.

If this key is executed, current setting will be shown in the interrupt display section.

Type of curve fit can be changed by use of the rotary knob or step keys.

Following 5 types of curve fits are available:

- GAUSSIAN (Normal distribution curve)
- LORENZIAN (Lorenz curve)
- 3RD POLY (Cubic expression)
- 4TH POLY (Biquadratic expression)
- 5TH POLY (Pentagonal expression)

(32) <CVFT THR **.* dB> key

In calculation of NF, this key sets threshold for the curve fit.

When this key is executed, current mask value will be shown in the interrupt display section.

The threshold can be varied in the range of 0.1 to 99.9 dB (0.1 step) by use of the rotary knob, step keys or ten-key.

⑪

OFFSET SPACING	Selects a display item from the WDM list.
REF CHNEL HIGHEST	Sets the reference based on the channel peak at the highest level.
REF CHNEL ****. ** nm	Sets the reference based on the channel peak nearest to the specified wavelength.
REF CHNEL NO. **	Sets the reference based on the channel peak of the specified channel number.
THRESH **. * dB	Sets a threshold used to determine the channel peak.
MAX NUM ***	Sets the maximum number of channel peak values to be listed.
MODE DIFF **. * dB	Sets the minimum difference between the highest and lowest waveforms during channel peak detection.
RETURN	Returns to the ANALYSIS software key menu. (To ①)

△
PARAMETER
ANALYSIS

(33) <OFFSET SPACING> key

Selects a display item from the WDM list.

OFFSET : Displays an offset based on any single channel.

SPACING : Displays an offset from the adjacent channel.

(34) <REF CHNEL HIGHEST> key

Sets the reference at the highest channel peak of OFFSET WL and OFST LVL displayed on the WDM list. This key is valid only when the OFFSET of Item (33) has been selected.

(35) <REF CHNEL ****.**nm> key

Sets the reference at the channel peak closest to the "****.**nm" wavelength of OFFSET WL and OFST LVL displayed on the WDM list.

The allowable setting range is 350.00 to 1750.00 nm (at 0.01 step) using the rotary knob, step keys, or numeric keys. This key is valid only when the OFFSET of Item (33) has been selected.

(36) <REF CHNEL NO.**> key

Sets the reference at the "**"-th channel peak of OFFSET WL and OFST LVL displayed on the WDM list.

The allowable setting range is 1 to 99 (at 1 step) using the rotary knob, step keys, or numeric keys.

This key is valid only when the OFFSET of Item (33) has been selected.

(37) <THRESH **.*dB> key

Sets a threshold for channel peak measurement.
The allowable setting range is 0.1 to 50.0 dB (at 0.1 step) using the rotary knob, step keys, or numeric keys.

(38) <MAX NUM ***> key

Sets the maximum number of channel peak values to be displayed on the list.
The allowable setting range is 1 to 99 (at 1 step) using the rotary knob, step keys, or numeric keys.

(39) <MODE DIFF **.*dB> key

Sets the minimum difference between the top and bottom of channel peak when it is determined.
The allowable setting range is 0.0 to 50.0 dB (at 0.1 step) using the rotary knob, step keys, or numeric keys.

The List displayed by <WDM> key

<WDM ANALYSIS> REF CHANNEL:HIGHEST
THRESH: 20.0 dBm MAX NUMBER: 20 MODE DIFF: 3.0 dB

NO.	WAVELENGTH [nm]	LEVEL [dBm]	OFFSET WL [nm]	OFST LVL [dB]	NOISE(/nm) [dBm]	SNR [dB]
01	1550.000	−12.34	−1.000	−2.34	−40.00	27.66
02	1551.000	−10.00	(REF)	(REF)	−35.00	25.00
03	1552.500	−15.00	1.500	−5.00	−30.00	15.00
04	1553.000	−20.00	2.500	−10.00	−32.00	12.00

If the list exceeds a single screen page, it can be scrolled up or down by the rotary knob or step keys

Explanation

WAVELENGTH (*1)	:	Wavelength of each channel peak
LEVEL	:	Signal level of each channel peak
OFFSET WL (*2)	:	Wavelength difference from the reference channel peak
OFST LVL (*2)	:	Level difference from the reference channel peak
NOISE (/nm)	:	Noise level at channel peak (The calculation method will be determined separately.)
SNR	:	Difference between the channel peak level and noise level

*(*1) Displayed in frequency if the marker is in the frequency length display mode.*
*(*2) Displayed in SPACING and LVL DIFF modes if the SPACING has been selected.*

5.1.9 [TRACE] switch

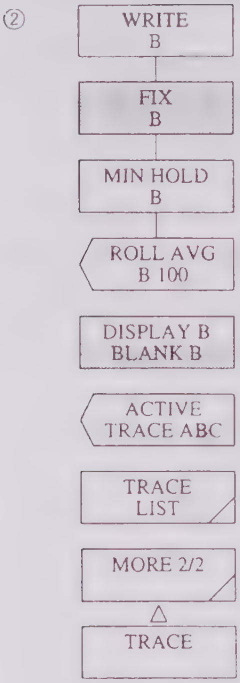
When this switch is pressed, the soft key menu (①, ② or ③) corresponding to the selected active trace (A, B or C) is displayed.

For the trace A

①

WRITE A	Sets the trace A to the write mode.
FIX A	Sets the trace A to the fixed data mode.
MAX HOLD A	Sets the trace A to the maximum value detection mode.
ROLL AVG A 100	Sets the trace A to the sequential addition mode.
DISPLAY A BLANK A	Selects whether the trace A is to be displayed on the screen or not. (Toggle)
ACTIVE TRACE ABC	Selects the active trace. (Toggle)
TRACE LIST	Displays the active list in the window. (To ⑤)
MORE 1/2	Displays the soft key menu of 2/2. (To ④)
TRACE	

For the trace B



WRITE B	Sets the trace B to the write mode.
FIX B	Sets the trace B to the fixed data mode.
MIN HOLD B	Sets the trace B to the minimum value detection mode.
ROLL AVG B 100	Sets the trace B to the sequential addition mode.
DISPLAY B BLANK B	Selects whether the trace B is to be displayed on the screen or not. (Toggle)
ACTIVE TRACE ABC	Selects the active trace. (Toggle)
TRACE LIST	Displays the active list in the window. (To ⑤)
MORE 2/2	Displays the soft key menu of 2/2. (To ④)

(1) <WRITE A> key

Sets the trace A to the write mode.

In this mode, the measured data is used as trace-A data as it is and displayed on the screen.

The trace display by the side of the data area becomes "WRITE".

(2) <FIX A> key

Sets the trace A to the fixed data mode.

In this mode, the data of the trace A is not changed after measurement, so that the waveforms on the screen remain without change.

The trace display by the side of the data area becomes "FIX".

When the <FIX A> key is pressed during a sweep, the waveform displayed at that time is fixed as it is.

All of the trace A, B and C become "FIX, the <STOP> key is displayed in reverse video, and the sweep stops. Then, WARNING is displayed.

(3) <MAX HOLD A> key

Sets the trace A to the maximum value detection mode.

In this mode, the maximum value at each measurement point is detected at each measurement and written into the trace A.

The detection of the maximum value is not affected by the set value of NOISE MASK.

NOISE MASK is executed when the result of maximum value detection is displayed.

The trace display by the side of the data area becomes "MAX HLD".

(4) <ROLL AVG A> key

Sets the trace A to the sequential addition mode.

In this mode, sequential averaging is performed at each measurement point at each measurement and its result is written into the trace A.

After execution, the current number of averaging times is displayed in the interrupt display section.

The number of averaging times can be changed in the range of 2 to 100 (1 step) by the rotary knob, step keys or ten-key pad.

Sequential averaging is not affected by the set value of NOISE MASK.

NOISE MASK is executed when the result of sequential averaging is displayed.

The trace display by the side of the data area becomes "ROL AVG".

Averaging is performed by the following expression.

$$Wj(i) = Wj - 1(i) \cdot \frac{n-1}{n} + W(i) \, \frac{1}{n} \qquad (i = 1, 2, \cdots N)$$

Wj(i) : New displayed waveform
Wj−1(i) : Existing displayed waveform
W(i) : New obtained waveform
N : Number of samples
n : Number of averaging times

(5) <DISPLAY A BLANK A> key

Selects whether the trace A is to be displayed on the screen or not.

When this key is pressed, the "DISPLAY A" is replaced with the "BLANK A".

In the "DISPLAY A" status, a waveform is displayed.

At this time, the trace display by the side of the data area becomes "DSP".

In the "BLANK A" status, no waveform is displayed on the screen. At this time, the trace display by the side of the data area becomes "BLK" and the marker and marker value disappear.

(6) <ACTIVE TRACE ABC> key

Selects the active trace.

Each time this key is pressed, the active trace latch is switched in rotation in the order of A, B, C and A.

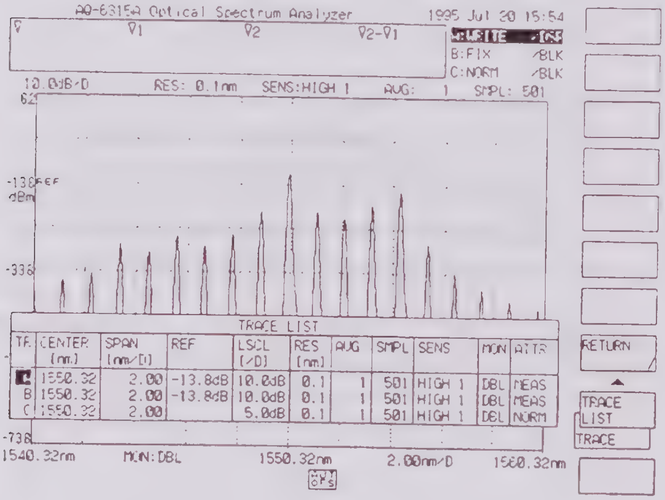
NOTE

The trace that is used when the following functions are executed is called the "active trace":

- *PEAK CENTER, AUTO CENTER, PEAK REF LEVEL, or AUTO REF LEVEL*
- *Moving marker display*
- *PEAK SEARCH or BOTTOM SEARCH*
- *ANALYSIS*

(7) <TRACE LIST> key

Opens the window and displays the measuring condition list for the trace A, trace B and trace C.



WRITE
B:FIX /BLK
C:NORM /BLK

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

1540.32nm 1550.32nm 2.00nm/D 1560.32nm

TRACE LIST

TR.	CENTER [nm]	SPAN [nm/[I]	REF	LSCL [/D]	RES [nm]	AVG	SMPL	SENS	MON	ATTR
A	1550.32	2.00	-13.8dB	10.0dB	0.1	1	501	HIGH 1	DBL	MEAS
B	1550.32	2.00	-13.8dB	10.0dB	0.1	1	501	HIGH 1	DBL	MEAS
C	1550.32	2.00		5.0dB	0.1	1	501	HIGH 1	DBL	NORM

Trace List Display Screen

(8) <WRITE B> key

Sets the trace B to the write mode.

In this mode, the measured data is used as trace-B data as it is and displayed on the screen.

The trace display by the side of the data area becomes "WRITE".

(12) <DISPLAY B BLANK B> key

Selects whether the trace B is to be displayed on the screen or not.

When this key is pressed, the "DISPLAY B" is replaced with the "BLANK B".

In the "DISPLAY B" status, a waveform is displayed on the screen. At this time, the trace display by the side of the data area becomes "DSP".

In the "BLANK B" status, no waveform is displayed on the screen. At this time, the trace display by the side of the data area becomes "BLK" and the marker and marker value disappear.

For the trace C

③

WRITE C	Sets the trace C to the write mode.
FIX C	Sets the trace C to the fixed data mode.
CALCULATE C	Sets the trace C to the arithmetic mode. (To ⑥)
EFFECT C	Processes the waveform of the trace C, then displays it. (To ⑦)
DISPLAY C BLANK C	Selects whether the trace C is to be displayed on the screen or not. (Toggle)
ACTIVE TRACE ABC	Selects the active trace. (Toggle)
TRACE LIST	Displays the trace list in the window. (To ⑤)
MORE 1/2	Displays the soft key menu of 2/2. (To ④)
△	
TRACE	

(9) <FIX B> key

Sets the trace B to the fixed data mode.

In this mode, the data of the trace B is not changed by measurement, so that the waveforms on the screen are not changed.

The trace display by the side of the data area becomes "FIX".

When the <FIX B> key is pressed during a sweep, the waveforms displayed at that time are fixed as they are. When all of the trace A, trace B and trace C become FIX, the <STOP> key is displayed in reverse video and the sweep stops.

Then, WARNING is displayed.

(10) <MIN HOLD B> key

Sets the trace B to the minimum value detection mode.

In this mode, the minimum value at each measurement point is detected at each measure-ment and written into the trace B.

The detection of the minimum value is not affected by the set value in NOISE MASK. NOISE MASK is executed when the result of minimum value detection is displayed.

The trace display by the side of the data area becomes "MIN HLD".

(11) <ROLL AVG B> key

Sets the trace B to the sequential addition mode.

In this mode, sequential averaging is performed at each measurement point at each measurement and written into the trace B.

After execution, the current number of averaging times is displayed in the interrupt display section.

The number of averaging times can be changed in the range of 2 to 100 (1 step) by the rotary knob, step keys or ten-key pad.

Sequential averaging is not affected by the set value of NOISE MASK.

NOISE MASK is executed when the result of sequential averaging is displayed.

The trace display by the side of the data area becomes "ROL AVG". Averaging is performed by the following expression.

$$W_j(i) = W_{j-1}(i) \cdot \frac{n-1}{n} + W(i)\,\frac{1}{n} \qquad (i = 1, 2, \cdots N)$$

$W_j(i)$: New displayed waveform
$W_{j-1}(i)$: Existing displayed waveform
$W(i)$: New obtained waveform
N : Number of samples
n : Number of averaging times

For the trace C

④	TRACE A→B	Copies the data of the trace A to the trace B.
	TRACE A→C	Copies the data of the trace A to the trace C.
	TRACE B→A	Copies the data of the trace B to the trace A.
	TRACE B→C	Copies the data of the trace B to the trace C.
	TRACE C→A	Copies the data of the trace C to the trace A.
	TRACE C→B	Copies the data of the trace C to the trace B.
	MORE 2/2	Displays the soft key menu of 1/2. (To ①,② or ③)
	△ TRACE	

(13) <WRITE C> key

Sets the trace C to the write mode.

In this mode, the measured data is used as trace-C data as it is and displayed on the screen.

The trace display by the side of the data area becomes "WRITE".

(14) <FIX C> key

Sets the trace C to the fixed data mode.

In this mode, the data of the trace C is not changed by measurement, so that the waveforms on the screen are not changed.

The trace display by the side of the data area becomes "FIX".

When the <FIX C> key is pressed during a sweep, the waveforms displayed at that time are fixed as they are. When all of the trace A, trace B and trace C become FIX, the <STOP> key is displayed in reverse video and the sweep stops. Then, WARNING is displayed.

(15) <CALCULATE C> key

Sets the trace C to the arithmetic mode.

In this mode, subtraction (LOG/linear value) or addition (linear value) are performed for the waveforms of the trace A and trace B by the selected status (calculation method) of the soft key menu displayed by pressing this key, and the results are written into the trace C.

The trace display by the side of the data area is changed to the display corresponding to the above latch status.

When trace A or B contains any data that cannot be calculated, WARNING is displayed.

(16) <EFFECT C> key

Processes the measured data of the trace C and displays it.

In this mode, one of the NORMALIZE, DOMINANT and CURVE FIT functions is executed depending on the selected status of the soft key menu displayed by pressing this key, and its result is written into the trace C. The result is displayed when the measurement is completed up to the end.

The trace display by the side of the data area is changed into the display corresponding to the above selected status.

(17) <DISPLAY C BLANK C> key

Selects whether the trace C is to be displayed on the screen or not.

When this key is pressed, the "DISPLAY C" is replaced with the "BLANK C".

In the "DISPLAY C" status, a waveform is displayed on the screen.

At this time, the trace display by the side of the data area becomes "DSP".

In the "BLANK C" status, no waveform is displayed on the screen. At this time, the trace display by the side of the data area becomes "BLK" and the marker and marker value disappear.

(18) <TRACE A → B> key

Copies the data of the trace A to the trace B.

After copying, the trace B becomes FIX.

The trace display by the side of the data area becomes "FIX".

(19) <TRACE A → C> key

Copies the data of the trace A to the trace C.

After copying, the trace C becomes FIX.

The trace display by the side of the data area becomes "FIX".

(20) <TRACE B → A> key

Copies the data of the trace B to the trace A.

After copying, the trace A becomes FIX.

The trace display by the side of the data area becomes "FIX".

(21) <TRACE B → C> key

Copies the data of the trace B to the trace C.

After copying, the trace C becomes FIX.

The trace display by the side of the data area becomes "FIX".

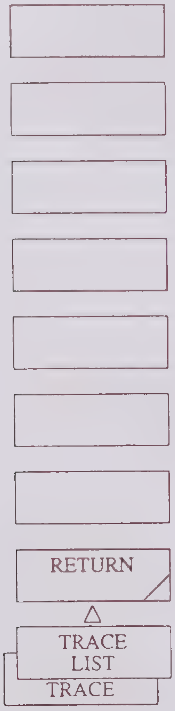
(22) <TRACE C → A> key

Copies the data of the trace C to the trace A.
After copying, the trace A becomes FIX.
The trace display by the side of the data area becomes "FIX".

(23) <TRACE C → B> key

Copies the data of the trace C to the trace B.
After copying, the trace B becomes FIX.
The trace display by the side of the data area becomes "FIX".

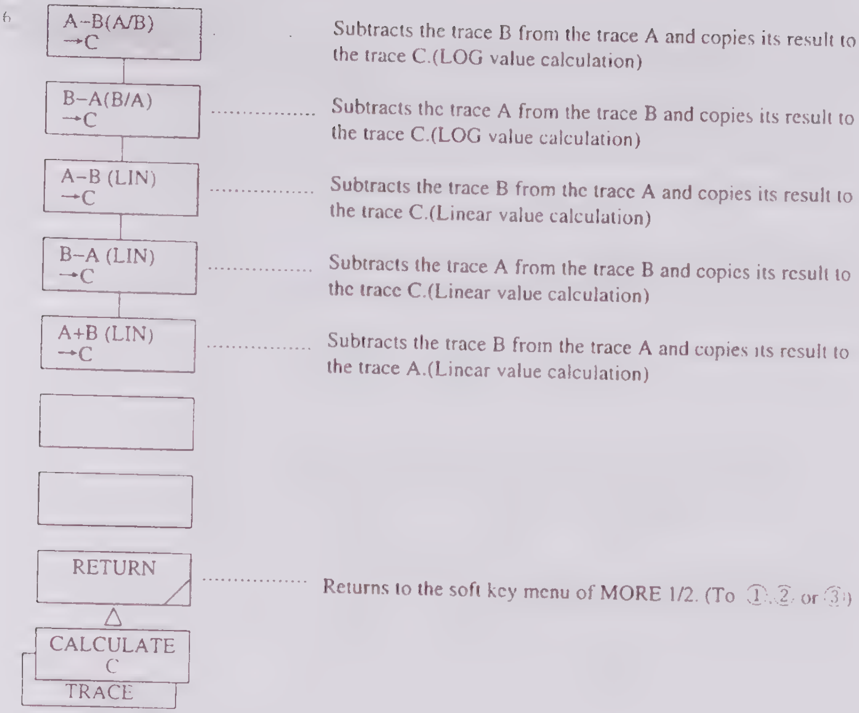
⑤



Returns to the soft key menu of MORE 1/2. (To ①,② or ③)

(24) <RETURN> key

Returns to the soft key menu of "MORE 1/2" (①, ② or ③).



Key	Description
A−B(A/B) →C	Subtracts the trace B from the trace A and copies its result to the trace C.(LOG value calculation)
B−A(B/A) →C	Subtracts the trace A from the trace B and copies its result to the trace C.(LOG value calculation)
A−B (LIN) →C	Subtracts the trace B from the trace A and copies its result to the trace C.(Linear value calculation)
B−A (LIN) →C	Subtracts the trace A from the trace B and copies its result to the trace C.(Linear value calculation)
A+B (LIN) →C	Subtracts the trace B from the trace A and copies its result to the trace A.(Linear value calculation)
RETURN	Returns to the soft key menu of MORE 1/2. (To ①,② or ③)

(25) <A − B (A/B) → C> key

Subtracts the data of the trace B from the trace A (in LOG value) and writes its result to the trace C.
When both trace A and trace B are set to BLANK, the subscale is displayed on the left of the screen.
In the other cases, the subscale is on the right of the screen.
When a waveform is recalled to the trace A or trace B, calculation and display are tried again.
When the center wavelength and span have been changed, calculation and display are tried again with new waveform data.
The trace display by the side of the data area becomes "A − B".
When the measuring condition (RESOLUTION) of the trace C does not agree with that of the trace B, WARNING is displayed.
In any case, calculation and display are performed.

(26) <B – A (B/A) → C> key

Subtracts the data of the trace A from the trace B (in LOG value) and writes its result to the trace C.
When both trace A and B are set to BLANK, the subscale is displayed on the left of the screen.
In the other cases, the subscale is displayed on the right of the screen.
When a waveform is recalled to the trace A or trace B, calculation and display are tried again.
When the center wavelength and span have been changed, calculation and display are tried again with new waveform data.
The trace display by the side of the data area becomes "B – A".
When the measuring condition (RESOLUTION) of the trace A does not agree with that of the trace B, WARNING is displayed.
In any case, calculation and display are performed.

(27) <A – B (LIN) → C> key

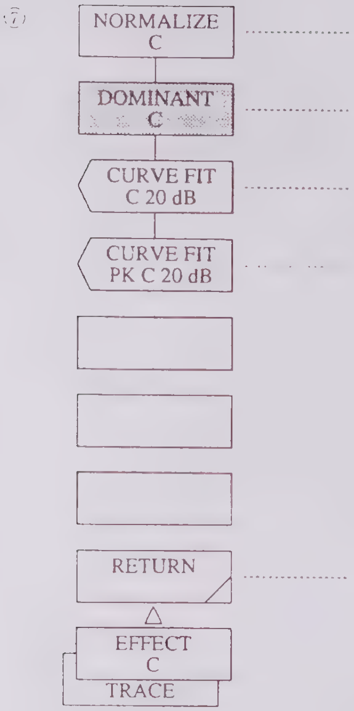
Subtracts the data of the trace B from the trace A (in linear value) and writes its result to the trace C.
When a waveform is recalled to the trace A or trace B, calculation and display are tried again.
When the center wavelength and span have been changed, calculation and display tried again with new waveform data.
The trace display by the side of the data area becomes "A – B LIN".
When the measuring condition (RESOLUTION) of the trace A does not agree with that of the trace B, WARNING is displayed.
In any case, calculation and display are performed.

(28) <B – A (LIN) → C> key

Subtracts the data of the trace A from the trace B (in linear value) and copies its result to the trace C.
When a waveform is recalled to the trace A or trace B, calculation and display are tried again.
When the center wavelength and span have been changed, calculation and display are tried again with new waveform data.
The trace display by the side of the data area becomes "B – A LIN".
When the measuring condition (RESOLUTION) of the trace A does not agree with that of the trace B, WARNING is displayed.
In any case, calculation and display are performed.

(29) <A + B (LIN) → C> key

Adds the data of the trace A to that of the trace B (in linear value) and copies its result to the trace C.
When a waveform is recalled to the trace A or trace B, calculation and display are tried again.
When the center wavelength and span have been changed, calculation and display are tried again with new waveform data.
The trace display by the side of the data area becomes "A + B LIN".
When the measuring condition (RESOLUTION) of the trace A does not agree with that of the trace B, WARNING is displayed.
In any case, calculation and display are performed.



NORMALIZE C: Normalizes the trace C and displays its result.

DOMINANT C: Performs the dominant for the trace C and displays its result.

CURVE FIT C 20 dB: Performs curve fit processing for the trace C and displays its result.

CURVE FIT PK C 20 dB: Performs curve fit for the peak of the trace C and displays its result.

RETURN: Return to the soft key menu of MORE 1/2. (To ①,② or ③)

(30) <NORMALIZE C> key

Normalizes the data of the trace C so that the peak point is set to 0 or 1 dB and displays its result.
The normalized data is displayed when the sweep is completed up to the end.
When both trace A and trace B are set to BLANK, the subscale is displayed on the left of the screen.
In the other cases, the subscale is displayed on the right of the screen.
The trace display by the side of data area becomes "NORM".

(31) <DOMINANT C> key

Performs the dominant of the trace C through spectral luminous efficacy compensation and displays its result.
The normalized data is displayed when the sweep is completed up to the end.
When both trace A and trace B are set to BLANK, the subscale is displayed on the left of the screen.
In the other cases, the subscale is displayed on the right of the screen.
The trace display by the side of the data area becomes "DOMI".

(32) <CURVE FIT C> key

Performs carve fit for the trace C and displays its result.

The data to be calculated is all that exceeds the limit value.

After execution, the current limit value is displayed in the interrupt display section.

The limit value can be changed in the range of 0 to 99 dB (1 step) by the rotary knob, step keys or ten-key pad.

The trace display by the side of the data area becomes "CV FIT".

(33) <CURVE FIT PK C> key

Performs curve fit for the peak of the trace C and displays its result.

The data to be calculated is all that exceeds the limit value.

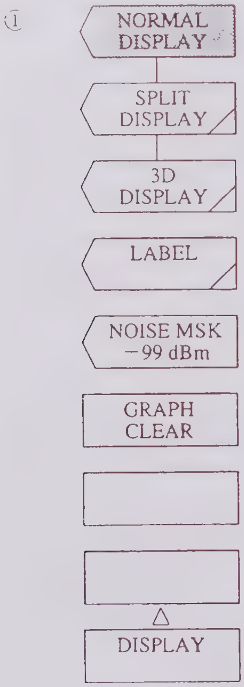
After execution, the current limit value is displayed in the interrupt display section. The limit value can be changed in the range of 0 to 99 dB (1 step) by the rotary knob, step keys or ten-key pad.

The trace display by the side of the data area becomes "CVFIT PK".

5.1.10 [DISPLAY] switch

The related screen display functions have been grouped in the DISPLAY switch area.

When this switch is pressed, the soft key menu of ① is displayed.



Sets the screen to the normal display mode.

Sets the screen to the 2-split display. (To ②)

Sets the screen to the 3-dimensional display mode. (To ③)

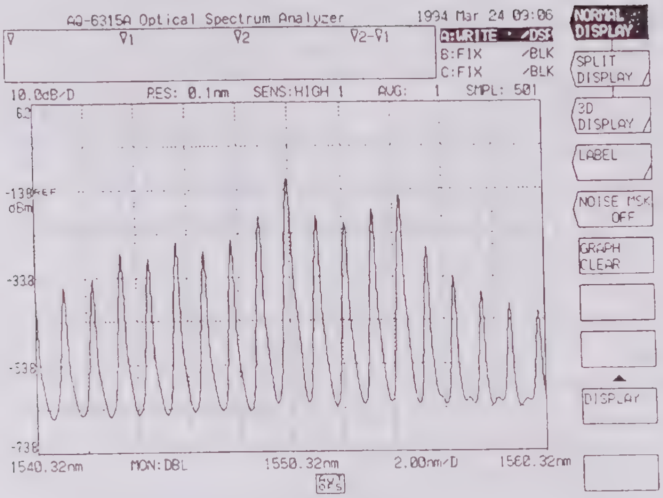
Sets the screen to the label input mode. (To ④)

Masks and displays the waveforms not exceeding the set value.

Clears the waveforms of the trace A, trace B and trace C into a no data status.

(1) <NORMAL DISPLAY> key

Sets the screen to the normal display mode.


AQ-6315A Optical Spectrum Analyzer 1994 Mar 24 09:06

A:WRITE /DSP

B:FIX /BLK

C:FIX /BLK

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

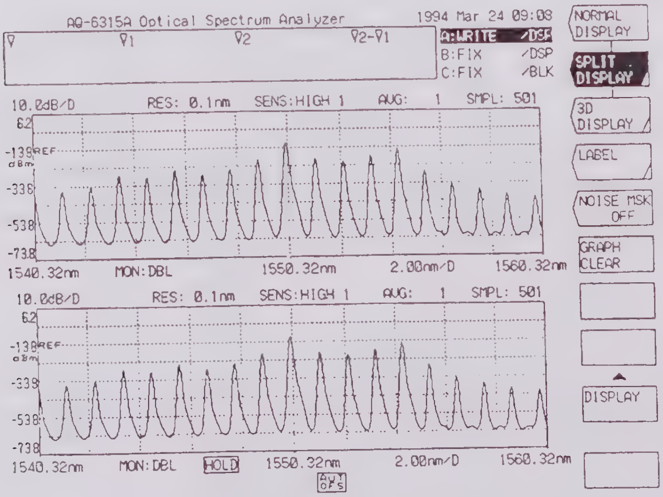
1540.32nm MON:DBL 1550.32nm 2.00nm/D 1560.32nm

(2) <SPLIT DISPLAY> key

Sets the screen to the upper/lower 2-split display mode.

The trace selected by the <TRACE A UP LOW>, <TRACE B UP LOW> or <TRACE C UP LOW> key is assigned.

When this key is turned on and off, the status of the <UPPER HOLD> or <LOWER HOLD> key is cleared.


AQ-6315A Optical Spectrum Analyzer 1994 Mar 24 09:08

A:WRITE /DSP

B:FIX /DSP

C:FIX /BLK

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

1540.32nm MON:DBL 1550.32nm 2.00nm/D 1560.32nm

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

1540.32nm MON:DBL HOLD 1550.32nm 2.00nm/D 1560.32nm

(3) <3D DISPLAY> key

Sets the screen to the 3-dimensional display mode.

In the 3-dimensional display, the Z axis (axis in the direction of depth) is added and 3 to 16 spectrums can be displayed at the same time. Updated waveforms are displayed forward on the screen by sweep and each of the previous waveforms is shifted backward.

The waveform to be handled in the 3-dimensional display mode is displayed by the function of the trace C. However, When the <FIX C> key is selected, the <WRITE C> key is selected instead.

When the <BLANK C> key is selected, the <DISPLAY C> key is latched instead.

When this key is OFF, the waveforms on 3-dimensional display are copied to the trace C.

NOTE

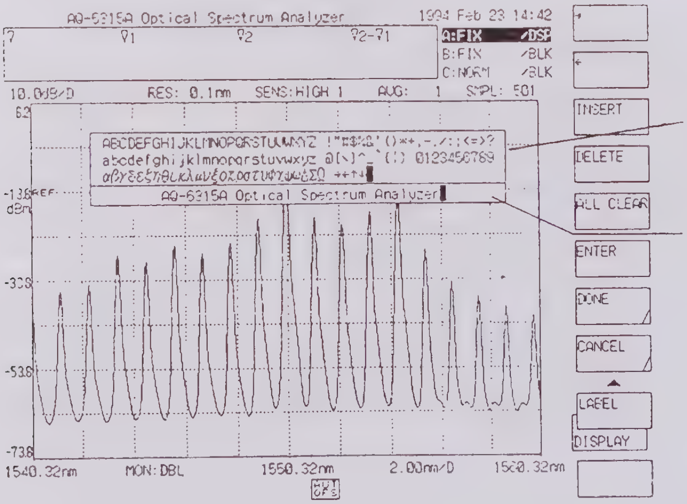
> *Each waveform in the 3-dimensional display mode is saved in the 32 nonvolatile memories of this equipment.*
> *The number indicated on the Z axis scale correspond to the memory number.*
> *Accordingly, to reference a specific waveform on 3-dimensional display on the normal display screen, recall the memory corresponding to the number of the Z axis scale of the waveform. (Refer to 5.1.11 [MEMORY] switch.)*

(4) <LABEL> key

Sets the screen to the label input mode.

With this key, various messages such as a comment input to the label area and a program name input in the program function are entered.

When this key is pressed, a window for character selection is opened on the screen and a cursor appears on both window and label area. The cursor on the window can be moved by the rotary knob or step keys. The soft key menu is changed into the contents of the label function. The key displayed in this soft key menu is used for entering a label.



AQ-6315A Optical Spectrum Analyzer 1994 Feb 23 14:42

A:FIX /DSP
B:FIX /BLK
C:NORM /BLK

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

ABCDEFGHIJKLMNOPQRSTUVWXYZ !"#$%&'()*+,-./:;<=>?
abcdefghijklmnopqrstuvwxyz @[\]^_`{|} 0123456789
αβγδεζηθικλμνξοπρστυφχψωΣΩ ←→↑↓

AQ-6315A Optical Spectrum Analyzer

1540.32nm MON:DBL 1550.32nm 2.00nm/D 1560.32nm

Window for character selection

Label input area

Label Input Screen

(5) <NOISE MSK> key

Masks and displays the waveforms not exceeding the set value at waveform display.

When a noise mask value is set, the waveform is rewritten in real time.

When this key is pressed, the current noise mask value is displayed in the interrupt display section.

The noise mask value can be changed in the range of OFF and 0 to −100 dBm (1 step) by the rotary knob, step keys or ten-key pad.

If the <MARKER → REF LEVEL> key is executed when a marker is positioned at the noise mask level, WARNING is displayed.

When the noise mask value is set to any value other than OFF, NOI MSK is displayed at the bottom of the screen.

(6) <GRAPH CLEAR> key

Clears the waveforms of the trace A, trace B and trace C into a no data status.

(In the normal display mode or 2-split display mode) In the 3-dimensional display mode, only the waveforms are cleared.

②

TRACE A UP LOW	Assigns the trace A to the upper side or lower side at the 2-split display. (Toggle)
TRACE B UP LOW	Assigns the trace B to the upper side or lower side at the 2-split display. (Toggle)
TRACE C UP LOW	Assigns the trace C to the upper side or lower side at the 2-split display. (Toggle)
UPPER HOLD	Fixes the trace assigned to the upper side at the 2-split display. (Toggle)
LOWER HOLD	Fixes the trace assigned to the lower side at the 2-split display. (Toggle)
RETURN	Returns to the soft key menu of ①.

△

SPLIT DISPLAY

DISPLAY

(7) <TRACE A UP LOW> key

Sets the trace A to the upper side or lower side in the 2-split display mode.
In the "UP" selected status, the trace A is assigned to the upper side.
In the "LOW" selected status, it is assigned to the lower side.
When the setting has been changed, the trace A moves from upper to lower or from lower to upper.
When trace assignment has been changed, the HOLD status is cleared and WARNING is displayed.

(8) <TRACE B UP LOW> key

Sets the trace B to the upper side or lower side in the 2-split display mode.
In the "UP" selected status, the trace B is assigned to the upper side.
In the "LOW" selected status, it is assigned to the lower side.
When the setting has been changed, the trace B moves from upper to lower or from lower to upper.
When trace assignment has been changed, the HOLD status is cleared and WARNING is displayed.

(9) <TRACE C UP LOW> key

Sets the trace C to the upper side or lower side in the 2-split display mode.
In the "UP" selected status, the trace C is assigned to the upper side.
In the "LOW" selected status, it is assigned to the lower side.
When the setting has been changed, the trace C moves from upper to lower or from lower to upper.
When the trace assignment has been changed, the HOLD status is cleared and WARNING is displayed.

(10) <UPPER HOLD> key

When this key is pressed into a selected status, the trace assigned to the upper side in the 2-split display mode is fixed and the scale is also fixed.
When the selected status is cleared by pressing this key again, the scale is changed into the updated setting and the waveform is also changed.
If the trace is changed from FIX to another in the selected status, WARNING is displayed as soon as the selected status is cleared.

(11) <LOWER HOLD> key

When this key is pressed into a selected status, the trace assigned to the lower side in the 2-split display mode is fixed and the scale is also fixed.
When the selected status is cleared by pressing this key again, the scale is changed into the updated setting and the waveform is also changed.
When the trace is changed from FIX into another in the selected status, WARNING is displayed as soon as the selected status is cleared.

(12) <RETURN> key

Returns to the soft key menu of ①.

③

ANGLE − 30 deg	Sets the 3-dimensional display angle.
RECALL	Redisplays the waveform group cleared in the 3-dimensional display mode.
Z−SCALE 16	Sets the number of waveforms displayed in the 3-dimensional display mode.
MEMORY 1st 2nd	Sets the memories (0 to 15, 16 to 31) for 3-dimensional display. (Toggle)
RETURN	Returns to the soft key menu of ①

△

3D
DISPLAY
DISPLAY

(13) <ANGLE> key

Sets the 3-dimensional display angle.

When this key is pressed, the current angle is displayed in the interrupt display section.

The angle can be changed in the range of +50 to −50 deg (10 steps) by the rotary knob, step keys or ten-key pad.

As soon as the angle is changed, the waveform is rewritten according to the new angle.

(14) <RECALL> key

Redisplays the waveform group cleared by pressing the <GRAPH CLEAR> key or setting the 3-dimensional display mode again after sweeping in the normal display mode.

When the RECALL conditions are not satisfied, WARNING is displayed.

NOTE

The prior condition for redisplay is that the type of each waveform and measuring conditions (mean wavelength and span) for 3-dimensional display must be coincident. That is, after measurement in the 3-dimensional display mode, this mode is changed into the normal display mode and the waveforms measured under different conditions are saved into the memory used as a buffer for 3-dimensional display. In this case, these waveforms cannot be redisplayed even if the <RECALL> key is pressed. Besides, if the selected status of the <MEMORY 1st 2nd> key is switched or a sweep is made by changing the Z scale, redisplay is disabled.

(15) <Z-SCALE> key

Sets the number of waveforms to be displayed simultaneously in the 3-dimensional display mode. When this key is pressed, the current number of waveforms is displayed in the interrupt display section. The number of waveforms can be changed in the range of 3 to 16 (1 step) by the rotary knob, step keys or ten-key pad.

After the number of waveforms of the Z scale is set to n by this key, the first memories corresponding to n waveforms out of the memories (1st: 0 to 15, 2nd: 16 to 31) selected by the <MEMORY 1st 2nd> key are used as buffers for 3-dimensional display.

For example, if the Z scale is set to 5 waveforms when "2nd" is selected by the <MEMORY 1st 2nd> key, memories 16, 17, 18, 19 and 20 are used as buffers.

By sweeping, the number display of the Z scale is changed in rotation between 16 and 20 as 16, 17, 18, 19, 20, 16, 17...

(16) <MEMORY 1st 2nd> key

Selects memories (1st or 2nd) to be used as buffers for 3-dimensional display.

In the "1st" selected status, memories 0 to 15 are used.

In the "2nd" selected status, memories 16 to 31 are used.

This equipment is provided with 32 nonvolatile memories for storing waveforms. In the 3-dimensional display mode, the first memories corresponding to the number of waveforms of the Z scale out of the first half (memories 0 to 15) or the second half (memories 16 to 31) of the 32 memories are used as buffers.

④

→	Moves the cursor in the label input area one character to the right.
←	Moves the cursor in the label input area one character to the left.
INSERT	Inserts a blank character into the cursor position in the label input area.
DELETE	Deletes the chracter at the cursor position in the label input area.
ALL CLEAR	Clears all the chracter strings in the label input area.
ENTER	Sets the characters on the label window into the label input area.
DONE	Copies the character strings in the label input area to the label area.
CANCEL	Cancels the label input and returns to the soft key menu of ①.

△

LABEL

DISPLAY

(17) <→> key

Moves the cursor in the label input area one character to the right in the label input status.
When this key is continuously pressed for 0.5 sec or more, an auto repeat operation is performed.

(18) <←> key

Moves the cursor in the label input area one character to the left in the label input status.
When this key is continuously pressed for 0.5 sec or more, an auto repeat operation is performed.

(19) <INSERT> key

Inserts one blank character into the cursor position in the label input area in the label input status, shifting the character string existing on the right of the cursor to the right. When this key is continuously pressed for 0.5 sec or more, an auto repeat operation is performed.
To insert a character into the label area, move the cursor to the position of the corresponding character and press this key.
A space for the character to be inserted is made and the character is entered.

(20) <DELETE> key

Deletes one character at the cursor position in the label input area, shifting the character string existing on the right of the cursor to the left. When this key is pressed for 0.5 sec or more, an auto repeat operation is performed.
To delete only an optional character in the label area, move the cursor to the corresponding character and press this key.

(21) <ALL CLEAR> key

Clears all the character strings in the label input area in the label input status and moves the cursor to the left end.

(22) <ENTER> key

Sets the character at the cursor position in the window for character selection to the cursor position in the label input area. The character is entered in the label input area and the cursor is shifted one character to the right.

The <Enter> key of the numeric keypad also has the same functions.

(23) <DONE> key

Terminates an label input in the label input status and copies the character string in the label input area to the label area in the top of the screen.

After completion of the above processing, the window is closed and the soft key menu of ① is displayed again.

(24) <CANCEL> key

Cancels a label input and the soft key menu of ① is displayed again.

5.1.11 [MEMORY] switch

In this switch, waveforms are saved and recalled to/from memory and a memory list is displayed.

This equipment is provided with 32 (0 to 31) nonvolatile memories that can store and recall displayed waveforms.

The main measuring conditions of each memory or the list containing the contents of labels can be displayed by the <LBL LIST CONDTN> key so that the stored contents of the memory can be checked.

The following 13 types of waveforms can be stored into memory.

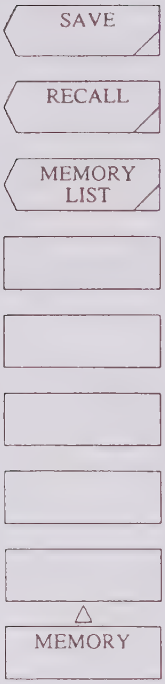
Table 5-1 shows the contents that are displayed in the ATTR (types of waveforms) columns of the label list and the condition list.

Table 5-1 Waveforms that Can be Stored into Memory

Table of waveform	ATTR column	Type of waveform	ATTR column
Measurement waveform	MEAS	Linear addition display waveform	A+B_L
Dominant display waveform	DOMI	Maximum value hold display waveform	MAX_H
Normalization display waveform	NORM	Minimum value hold display waveform	MIN_H
Subtraction display waveform	A–B	Sequential addition averaging display waveform	R AVG
Subtraction display waveform	B–A	Curve fit waveform	CVFT
Linear subtraction display waveform	A-B_L	Peak curve fit waveform	CVFTP
Linear subtraction display waveform	B-A_L		

When this switch is pressed, the soft key menu of ① is displayed.

①



SAVE .... Writes the contents of trace A, trace B or trace C into memory. (To ②)

RECALL .... Writes the contents of memory into the trace A, trace B and trace C. (To ③)

MEMORY LIST .... Displays the memory list on the window. (To ④)

(1) <SAVE> key

Writes the contents of the trace A, trace B or trace C.
When this key is pressed, the soft key menu of ② is displayed.
The screen display is changed into the trace list (display of trace A, B and C measuring conditions) display and the memory list (label list or condition list) display.
The memory list display is changed depending on the selected status of the <LBL LIST CONDTN> key.
As a means for storing waveforms into memory, a number specification method using the ten-key pad and a memory number selection method using the rotary knob or step keys in the memory list display status are available.

(a) Memory number specification method using the ten-key pad

To store waveforms, press this key, enter a desired memory number (0 to 31) by the ten-key pad, and press the <ENTER> key.
For example, to store waveforms into memory No.12, press [MEMORY], <SAVE>, [1], [2] and <ENTER>.

(b) Memory number selection method using the rotary knob or step keys

When the NO. column displayed in reverse video is shifted up and down to the upper end and lower end of the screen by the rotary knob or step keys, the screen is scrolled.

To store waveforms into memory, move the NO. column displayed in reverse video to the memory number and press the <ENTER> key.

With the above operations, a memory operation is performed and the memory list display is changed into the normal display.

Then, the trace name and the stored memory number are displayed in the interrupt display section like "A → MEM12".

In the list display, the ATTR column of the memory number storing no waveform is blank.

To return to the normal display screen without executing any memory operation, press the <CANCEL> key. At this time, the soft key menu of ① is displayed again.

(2) <RECALL> key

Reads the contents of memory to trace A, trace B or trace C

When this key is pressed, the soft key menu of ② is displayed.

The screen display is changed into the trace list (display of the measuring conditions of the trace A, trace B and trace C) display and the memory list (label list or condition list) display.

The memory list display depends on the selected status of the <LBL LIST CONDTN> key.

As a means for reading waveforms from memory, a number specification method using the ten-key pad and a memory number selection method using the rotary knob or step keys are available.

(a) Memory number specification method using the ten-key pad

To read waveforms, press this key, enter a desired memory number (0 to 31) by the ten-key pad, and press the <ENTER> key.

For example, to read a memory No.12, press [MEMORY], <RECALL>, [1], [2], and <ENTER>.

(b) Memory number selection method using the rotary knob or step keys

When the NO. column displayed in reverse video is shifted up and down to the upper end and lower end of the screen by the rotary knob or step keys, the screen is scrolled.

To read waveforms, move the NO. column displayed in reverse video to the memory number and press the <ENTER> key.

With the above operations, a read operation is performed and the memory list display is changed into the normal display. Then, the memory number and read trace name are displayed in the interrupt display section like "MEM12 → A".

In the list display, the ATTR column of the memory number storing no waveform is blank.

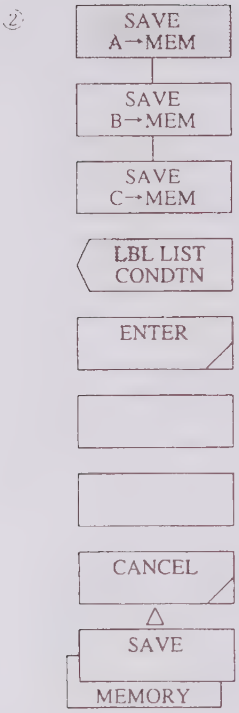
To return to the normal display screen without executing any read operation, press the <CANCEL> key. At this time, the soft key menu of ① is displayed again.

(3) <MEMORY LIST> key

Displays the memory list window.

The memory list includes the contents of trace. Accordingly, the trace list (display of the measuring conditions of the trace A, trace B and trace C) and the memory list (label list or condition list) are displayed on the screen.

②



SAVE A→MEM	Writes the contents of the trace A into memory.
SAVE B→MEM	Writes the contents of the trace B into memory.
SAVE C→MEM	Writes the contents of the trace C into memory.
LBL LIST CONDTN	Selects a type (label, condition) of memory list. (Toggle)
ENTER	Returns to the soft key menu of ① after execution of write processing.
CANCEL	Stops the write processing and returns to the soft key menu of ①.

(4) <SAVE A → MEM> key

Writes the contents of the trace A into memory.

If this key is pressed into a reverse video status when writing waveforms into memory, the above contents are executed.

(5) <SAVE B → MEM> key

Writes the contents of the trace B into memory.

If this key is pressed into a reverse video status when writing waveforms into memory, the above contents are executed.

(6) <SAVE C → MEM> key

Writes the contents of the trace C into memory.

If this key is pressed into a reverse video status when writing waveforms into memory, the above contents are executed.

(7) <LBL LIST CONDTN> key

Sets whether the memory list is to be displayed by the label list or by the condition list.

Each time this key is pressed, the reverse video status is changed and the corresponding list (label list or condition list) is displayed.

(8) <ENTER> key (SAVE)

Executes an operation for writing the contents of trace into memory, clear the window, and returns to the normal display screen. The soft menu key of ① is displayed again.

The [ENTER] switch in the ten-key pad functions in the same way as this key.

After this key is executed, the trace name and the corresponding memory No. are displayed in the interrupt display section. If a numeric value other than 0 to 31 is entered as a memory number by the ten-key pad, WARNING is displayed.

(9) <CANCEL> key (SAVE)

Cancels a write operation from a trace into memory, clears the window, and returns to the normal display screen.

The soft key menu of ① is displayed again.

③

RECALL MEM→A	Writes the contents of memory into the trace A.
RECALL MEM→B	Writes the contents of memory into the trace B.
RECALL MEM→C	Writes the contents of memory into the trace C.
LBL LIST CONDTN	Selects a type (label or condition) of memory list. (Toggle)
ENTER	Returns to the soft key menu of ① after execution of a read operation.
CANCEL	Cancels a read operation and returns to the soft key menu of ①
△	
RECALL	
MEMORY	

(10) <RECALL MEM → A> key

Reads the contents of memory into the trace A.

If this key is displayed in reverse video when reading from memory into the trace, the above contents are executed.

(11) <RECALL MEM → B> key

Reads the contents of memory into the trace B.

If this key is displayed in reverse video when reading from memory into the trace, the above contents are executed.

(12) <RECALL MEM → C> key

Reads the contents of memory into the trace C.

If this key is displayed in reverse video when reading from memory into the trace, the above contents are executed.

(13) <ENTER> key (RECALL)

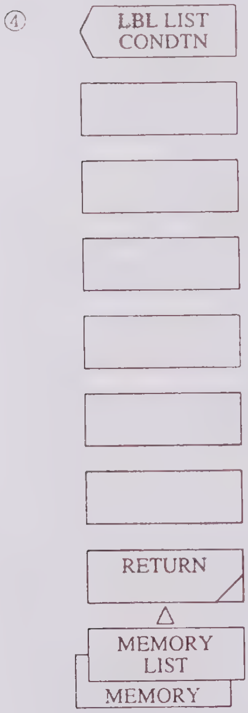
Executes an operation for reading the contents of memory into a trace, clears the window, and returns to the normal display screen. The soft key menu of ① is displayed again.

The [ENTER] key in the ten-key pad functions in the same way as this key.

After this key is executed, the memory number and the corresponding trace are displayed in the interrupt display section.

(14) <CANCEL> key (RECALL)

Cancels a read operation from memory into a trace, clears the window, and returns to the normal display screen. The soft key menu of ① is displayed again.



LBL LIST CONDTN ……………… Selects a type (label or condition) of memory list. (Toggle)

RETURN ……………… Returns to the soft key menu of ①.

(15) <RETURN> key

Returns to the soft key menu of ①.

5.1.12 [FLOPPY] switch

This equipment is provided with a 3.5-inch 2HD floppy disk to store and read waveforms and programs. For the details of this function, refer to Chapter 7 Floppy Disk Functions. The soft key menu is as follows. When this switch is pressed, the soft key menu of ① is displayed.

When the [FLOPPY] switch is pressed:

①

WRITE	Writes waveforms, programs and data into the FD. (To one of ② to ⑥) (*1)
READ	Reads waveforms, programs and data from the FD. (To one of ⑧ to ⑫) (*1)
TRACE RD/WRT	Specifies waveforms as those that are to be written/read to the FD.
PROGRAM RD/WRT	Specifies programs as those that are to be written/read to the FD.
DATA GRPH RD/WRT	Specifies the data to be written on or read from a floppy disk (FD), or specifies the graphics to be written on an FD.
SETTING RD/WRT	Specifies system information as what is to be written/read to the FD.
DIRECTORY	Displays the directory information in the FD. (To ⑬)
DISK INI-TIALIZE	Initializes the FD. (To ⑮)
△	
FLOPPY	

When the <TRACE RD/WRT> key is selected (write operation)

(2)

A B C→ FD	Writes any selected trace into the FD.
MEMORY→ FD	Writes the contents of memory into memory in the reverse video status.
3D→FD 1st 2nd	Writes the waveform group of 3-dimensional display into the FD in the reverse video status.
CURSOR UP DOWN	Moves the cursor between the memory list and file list.
FILE NAME	Enters the file name for writing into the FD. (*2)
BIN TXT BIN+ASC	Selects a data format for writing into the FD.
EXECUTE	Executes a write operation to the FD. (To ① or ⑦) (*3)
RETURN	Returns to the soft key menu of ① without executing a write operation.
△ WRITE FLOPPY	

When the <PROGRAM RD/WRT> key selected (write operation):

③	CURSOR UP DOWN	Moves the cursor between the memory list and file list.
	FILE NAME	Enters the file name for writing to the FD. (*2)
	EXECUTE	Executes a write operation to the FD. (To ① or ⑦) (*3)
	RETURN	Returns to the soft key menu of ① without executing a write operation.

△

WRITE

FLOPPY

When the <DATA GRPH RD/WRT> key is selected – the DATA is highlighted (write operation):

④

DATE & TIME	Writes the date and time into the FD in the reverse video status. (Toggle)
LABEL	Writes the contents of the label area into the FD in the reverse video status. (Toggle)
DATA AREA	Writes the contents of the data area into the FD in the reverse video status. (Toggle)
CONDITION	Writes setting conditions into the FD in the reverse video status. (Toggle)
FILE NAME	Enters the file name for writing to the FD. (*2)
ADD WRITE OVERWRITE	Selects the data writing mode.
EXECUTE	Executes a write operation to the FD. (To ① or ⑦) (*3)
RETURN	Returns to the soft key menu of ① without executing a write operation.

△

WRITE

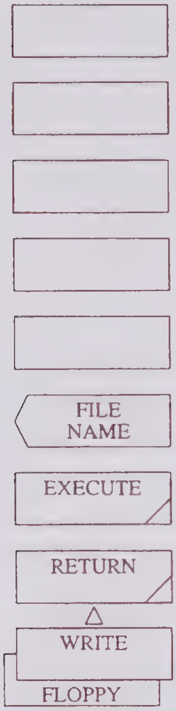
FLOPPY

When the <DATA GRPH RD/WRT> key is selected - the GRPH is highlighted (write operation):

⑤	B&W	Selects the monochrome color of graphics to be written on an FD.
	PRESET COLOR	Selects the default colors of graphics to be written on an FD.
	SCREEN COLOR	Selects the on-screen display colors of graphics to be written on an FD.
	BMP TIFF	Selects a format of file to be written on an FD.
	FILE NAME	Enters a name of file to be written on an FD.
	EXECUTE	Writes data and files on an FD. (Go to Step ① or ⑦.) *3
	RETURN	Returns to the soft key menu of Item ① without data saving.
	△	
	WRITE	
	FLOPPY	

When the <SETTING RD/WRT> key is selected (write operation):

⑥



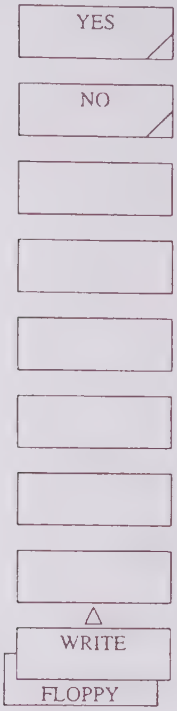
FILE NAME .... Enters the file name for writing to the FD. (*2)

EXECUTE .... Executes a write operation to the FD. (To ① or ⑦) (*3)

RETURN .... Returns to the soft key menu of ① without executing a write operation.

At an overwrite operation (write operation):

⑦



YES …… Returns to ① after executing a write operation.

NO …… Returns to ① without executing a write operation.

When the <TRACE RD/WRT> key is selected (read operation):

⑧

FD→ A B C	Reads from the FD into any selected trace.
FD→ MEMORY	Reads from the FD into memory in the reverse video status.
FD→3D 1st 2nd	Reads the waveform group of 3-dimensional display from the FD in the reverse video status.
CURSOR UP DOWN	Moves the cursor between the memory list and file list.
EXECUTE	Executes a read operation from the FD. (To ①)
RETURN	Returns to the soft key menu of ① without executing a read operation.

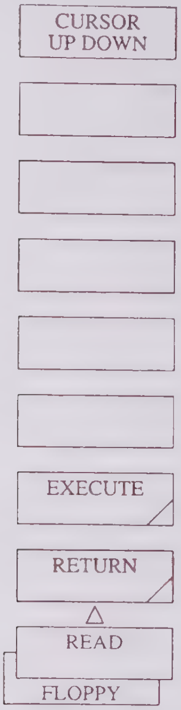
△

READ

FLOPPY

When the <PROGRAM RD/WRT> key is selected (read operation):

⑨



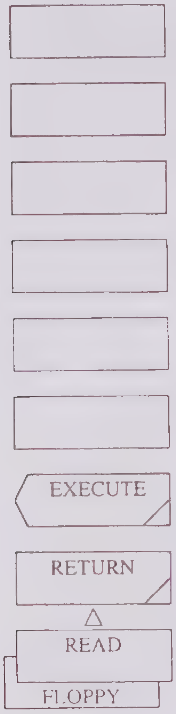
Moves the cursor between the memory list and file list.

Executes a read operation from the FD. (To ①)

Returns to the soft key menu of ① without executing a read operation.

When the <DATA GRPH RD/WRT> key is selected – the DATA is highlighted (read operation):

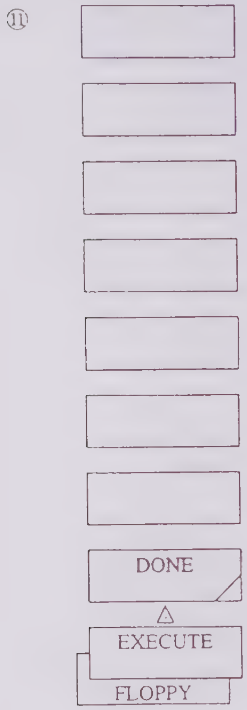
⑩



EXECUTE ...... Executes a read operation from the FD. (To ⑪)

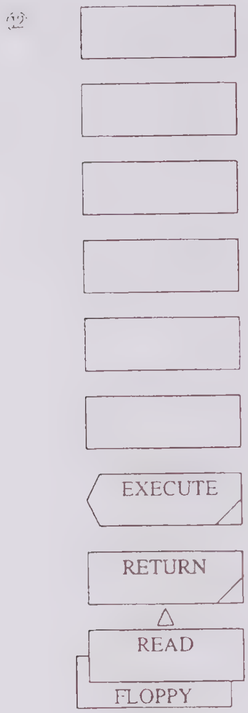
RETURN ...... Returns to the soft key menu of ① without executing a read operation.

When a data read operation is executed (read operation):



Returns to the soft key menu of ① canceling the data display.

When the <SETTING RD/WRT> key is selected (read operation):

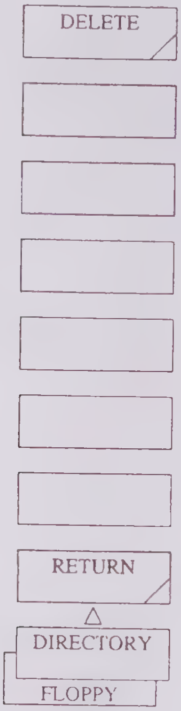


EXECUTE ………… Executes a read operation from the FD. (To ①)

RETURN ………… Returns to the soft key menu of ① without executing a read operation.

When the <DIRECTORY> key is pressed:

⑬

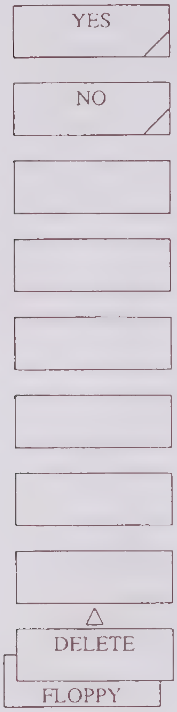


DELETE …………… Deletes the file or directory on the cursor line from the FD. (To ⑭)

RETURN …………… Returns to the soft key menu of ① canceling the directory display.

When a file or directory delete operation is executed:

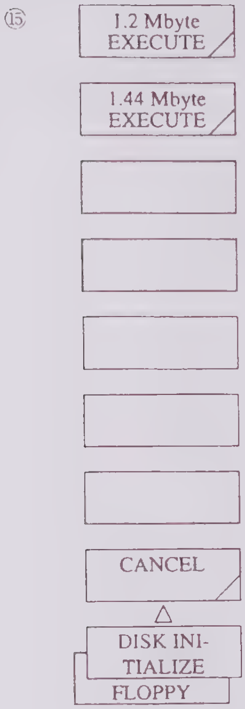
⑭



YES …… Returns to the soft key menu of ⑬ after executing a file delete operation.

NO …… Returns to the soft key menu of ⑬ without executing a file delete operation.

When the <DISK INITIALIZE> key is pressed:



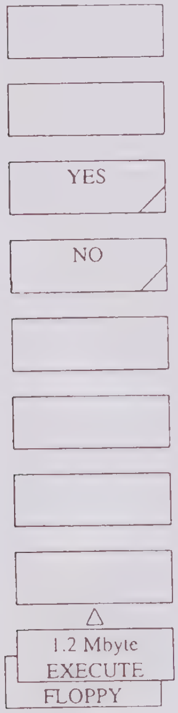
1.2 Mbyte EXECUTE .... Initializes the FD by 1.2M bytes. (To ⑯)

1.44 Mbyte EXECUTE .... Initializes the FD by 1.44M bytes. (To ⑱)

CANCEL .... Returns to the soft key menu of ① without initializing the FD.

When the <1.2 M byte EXECUTE> key is pressed:

⑯

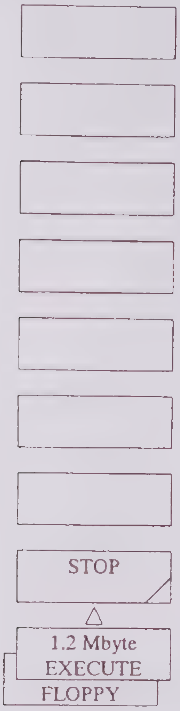


YES ……………… Initialize the FD. (⑰ to ①)

NO ……………… Returns to the soft key menu of ① without initializing the FD.

When an initialize operation (1.2 M bytes) is executed:

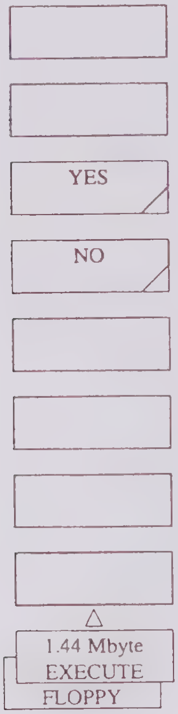
⑰



STOP .... Returns to the soft key menu of ① canceling FD initialization.

When the <1.44 M byte EXECUTE> key is pressed:

⑱

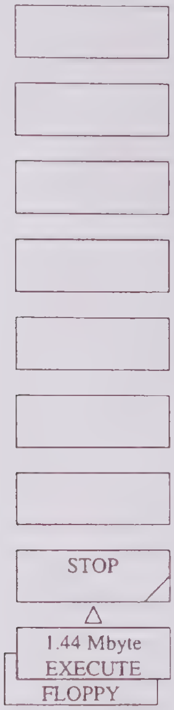


YES ………………… Initializes the FD. (⑲ to ①)

NO ………………… Returns to the soft key menu of ① without initializing the FD.

When an initialize operation (1.44M bytes) is executed:

⑲



Returns to the soft key menu of ① canceling FD initialization.

*1 : *When the <WRITE> key or <READ> key is pressed, the soft key menu to be displayed next depends on the selected status of the following 5 soft keys.*

Selected soft key	Soft key menu display	
	Write status	Read status
<TRACE RD/WRT>	②	⑧
<PROGRAM RD/WRT>	③	⑨
<DATA GRPH RD/WRT> Data is highlighted.	④	⑩
<DATA GRPH RD/WRT> GRPH is highlighted.	⑤	—
<SETTING RD/WRT>	⑥	⑫

*2 : *When the <FILE NAME> key is pressed, the same soft key menu as the <LABEL> key is displayed and the window for character selection is opened.*
By pressing the <DONE> key after entering a file name into the label input area, the soft key menu of ① is displayed again. (For the procedure for entering a file name, refer to 5.1.10 [DISPLAY] switch.)

*3 : *For an overwrite operation, the soft key menu for verification (⑦) is displayed.*

5.1.13 [PROGRAM] switch

Enters and executes programs.

For details of its function, refer to Chapter 6 Program Function.

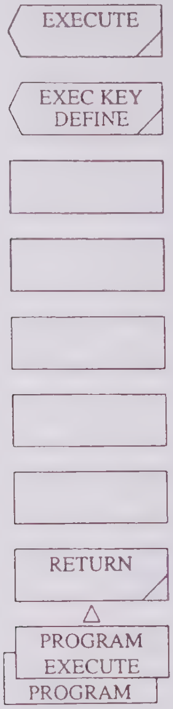
When this switch is pressed, the soft key menu of ① is displayed.

When the [PROGRAM] switch is pressed:

①	PROGRAM EXECUTE	Displays the program list to execute a program. (To ②)
	PROGRAM EDIT	Displays the program list to edit a program. (To ④)
	EXEC1 (**)	Executes the program in parentheses.
	EXEC2 (**)	Executes the program in parentheses.
	EXEC3 (**)	Executes the program in parentheses.
	EXEC4 (**)	Executes the program in parentheses.
	EXEC5 (**)	Executes the program in parentheses.
	EXEC6 (**)	Executes the program in parentheses. (To ④)
	△ PROGRAM	

When the <PROGRAM EXECUTE> key is pressed:

②



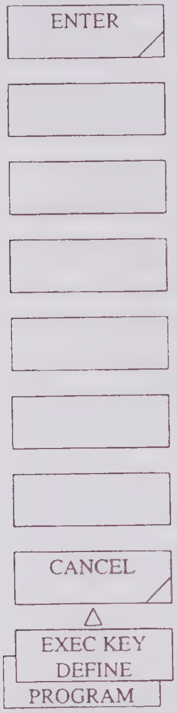
EXECUTE ·················· Executes the program selected in the program list.

EXEC KEY DEFINE ·················· Selects a program to be executed by the <EXEC1-6> key of ①. (To ③)

RETURN ·················· Returns to the soft key menu of ①.

When the <EXEC KEY DEFINE> key is pressed:

③



Registers the program to be executed to the <EXEC1 to 6> key. (To ②)

Stops registration to the <EXEC1 to 6> key. (To ②)

When the <PROGRAM EDIT> key is pressed:

④

PROGRAM NAME	Enters a name to the program selected in the list. (*1)
EDIT	Enters or modifies the program selected in the list. (To ⑤)
COPY	Determines a program to be copied and displays the cursor for copy destination selection. (To ⑦)
DELETE	Clears the selected program. (To ⑧)
RETURN	Returns to the soft key menu of ①.

△
PROGRAM EDIT
PROGRAM

When the <EDIT> key is pressed:

⑤

PROGRAM LINE	Moves the cursor displayed at the line No. in the program area.
COMMAND SELECT	Displays the command list of the panel switches (or special commands).
PARAMETER EDIT	Edits the parameter division of the command registered on the current line.
ENTER	Copies variopus commands in the program area and definitively sets parameter input values.
SPECIAL COMMAND	Displays the special command list.
LIST PRINT	Prints the program displayed in the program area.
MORE 1/2	Displays the soft key menu of ⑥.
RETURN	Returns to the soft key menu of ④. One out of three latch.

△

EDIT

PROGRAM

When the <MODE 1/2> key is pressed:

⑥

LINE INSERT	Inserts a blank line before the current line.
AREA SELECT	Sets the current line at the beginning of the line to be copied or deleted, providing the line-range select status.
AREA CUT	Copies the current line or the selected whole line range into the buffer and deletes it.
AREA COPY	Copies the current line or the selected whole line range into the buffer.
PASTE INSERT	Inserts the line copies in the buffer by the <AREA CUT> and <AREA COPY> keys into the current line.
PASTE OVERWRITE	Overwrites the line copied in the buffer by the <AREA CUT> and <AREA COPY> keys from the current line.
MORE 2/2	Displays the soft key menu of ⑤.
RETURN	Returns to the soft key menu of ④.

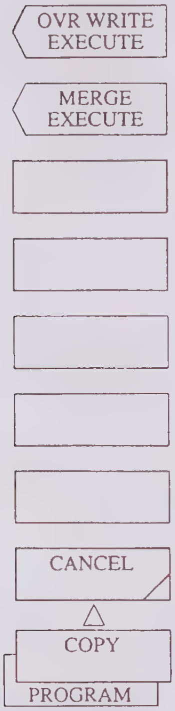
△

EDIT

PROGRAM

When the <COPY> key is pressed:

⑦

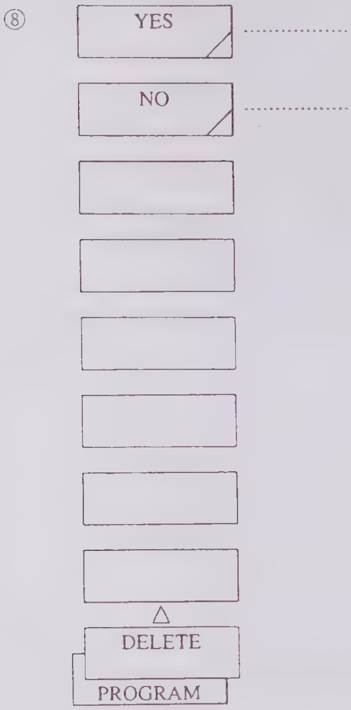


Copies the specified program into the number of copy destination. (To ④) (*2)

Adds the specified program after the program of copy destination. (To ④)

Stops program copy processing. (To ④)

When the <DELETE> key is pressed:



Executes program delete processing. (To ④)

Stops program delete processing. (To ④)

*1: *When the <PROGRAM NAME> key is pressed, the same soft key menu as the <LABEL> key is displayed and the window for character selection is opened.*
By pressing the <DONE> key after entering a file name into the label input area, the soft key menu of ④ is displayed again. (For the procedure for entering a file name, refer to 5.1.10 [DISPLAY] switch.)

*2: *When a program is already registered in the number of copy destination, it is overwritten.*
The program name is changed into the name of copy source.
After the execution, the soft key menu of ④ is displayed again.

5.1.14 [SYSTEM] switch

Registers printers, X-Y plotters and user keys, and sets date and time, screen display colors and addresses. When this switch is pressed, the soft key menu of ① is displayed.

①	COPY KEY PTR PLTR	Sets the device to output screen copies to the printer or plotter. (Toggle)
	COPY CONFIG	Sets printer or plotter output conditions. (To ③)
	USER KEY DEFINE	Registers user keys. The screen for registration is displayed.
	SET CLOCK	Sets the built-in clock. (To ⑤)
	SET COLOR	Sets the built-in clock. (To ⑥)
	MY ADRS 1	Sets addresses.
	MEAS WL AIR VAC	Sets measurement wavelength to either air wavelength or vaccum wavelength. (Toggle)
	MORE 1/2	Displays the soft key menu of ②.
	△ SYSTEM	

②

WL CAL	Calibrates the absolute value of wavelength. (To ⑧)
WL SHIFT	Sets the amount of wavelength shift.
LEVEL SHIFT	Sets the amount of level shift.
AUTO OFFSET	Automatically performs AMP offset periodically. (Toggle)
BUZZER	Sets the buzzer function. (To ⑨)
TEST MODE	Sets the test mode.
MORE 2/2	Returns to the soft key menu of ①.
△	
SYSTEM	

(1) <COPY KEY PTR PLTR> key

Sets the device to output screen copies to the printer or plotter.
Each time this key is pressed, the display in reverse video is switched between PTR and PLTR.
(For the usage of the printer or X-Y plotter, refer to 5.1.18 [COPY] switch.)

(2) <COPY CONFIG> key

Sets the copy format of the screen to be output to the printer or plotter.
When this key is pressed, the soft key menu for printer or plotter setting (③, ④) is displayed.

(3) <USER KEY DEFINE> key

Registers user keys.
When this key is pressed, the screen for registration is displayed.
The procedure for registration is shown below.

a) When the panel switch of the soft key to be registered is pressed, the soft key menu is changed into the corresponding key menu. Soft keys that cannot be registered are not displayed.

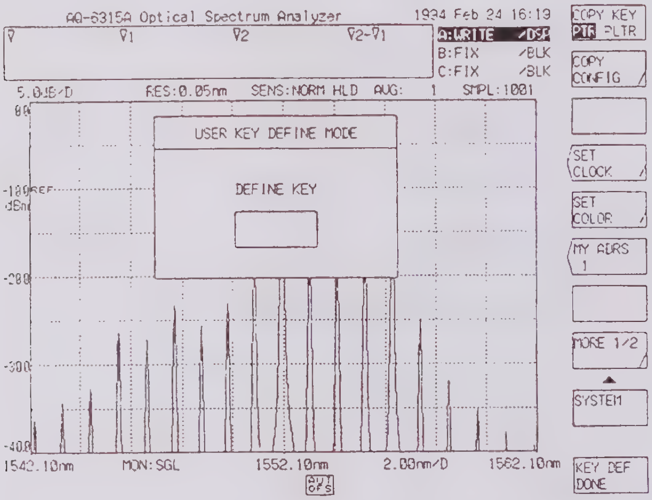
b) When the soft key to be registered is pressed, the soft key pressed in a) is displayed in the registration key display section in the screen is displayed.

c) In the status where the soft key to be registered is displayed in the registration key display section, press the [USER] switch. With this, the soft key menu is changed into that of the [USER] switch.

d) In the soft key menu of the [USER] switch, press the key to be registered.
Then, the selected soft key is registered as a user key, and also the registration key display section becomes blank.
If the user key is already registered, it is overwritten.

To register another soft key, repeat the above operations a) to d).
To terminate the user key register mode, press the auxiliary key <KEY DEFINE DONE>.
With this, the soft key menu of ① is displayed again.

As a rule, the only key that can be registered is the soft key displayed after the panel switch is pressed.
Registration is disabled for the soft key that was pressed next.
Soft keys that cannot be registered are not displayed.



AQ-6315A Optical Spectrum Analyzer 1994 Feb 24 16:19

A:WRITE /DSP
B:FIX /BLK
C:FIX /BLK

5.0dB/D RES:0.05nm SENS:NORM HLD AVG: 1 SMPL:1001

USER KEY DEFINE MODE

DEFINE KEY

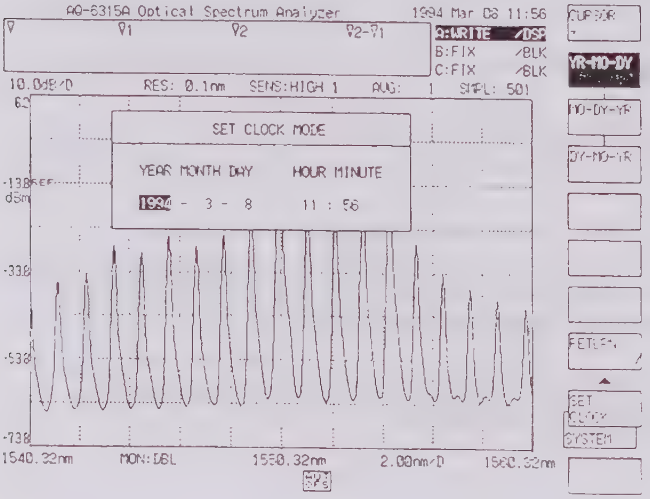
1542.10nm MON:SGL 1552.10nm 2.00nm/D 1562.10nm

When the <USER KEY DEFINE> key is pressed:

(4) <SET CLOCK> key

Sets the built-in clock.

When this key is pressed, the soft key menu of ⑤ and a window is displayed.



SET CLOCK MODE

YEAR MONTH DAY HOUR MINUTE

1994 - 3 - 8 11 : 56

When the <SET CLOCK> key is pressed:

(5) <SET COLOR> key

Sets display colors.

When this key is pressed, the soft key menu of ⑥ is displayed.

(6) <MY ADRS> key

Sets the GPIB address of this equipment.

When this key is pressed, the current set value is displayed in the interrupt display section.

The set value can be changed in the range of 0 to 30 by the rotary knob, step keys or ten-key pad.

This key sets the address of the first port. The address of the second port is fixed to 30.

(7) <MEAS WL AIR VAC> key

Switches measurement wavelength between air wavelength and vacuum wavelength.

If "AIR" is selected, air wavelength is set and vacuum wavelength is set when "VAC" is selected.

As long as vacuum wavelength is displayed ("VAC" is shown in reverse video), VAC WL will be shown at bottom of the screen.

*: *This function is used only for switching of measurement wavelength. Even if <MEAS WL AIR VAC> key is executed for waveform being displayed after measurement, switching of wavelength does not take place.*

(8) <WL CAL> key

Calibrates the wavelength. When this key is pressed, the window containing a message is displayed on the screen and the soft key menu of ⑧ is displayed. (*) The current set value is displayed in the interrupt display section.

As calibration steps, connect the laser for calibration to this equipment by single mode fiber cable and then press the corresponding soft key or change the set value displayed in the interrupt display section by the rotary knob, step keys or ten-key pad.

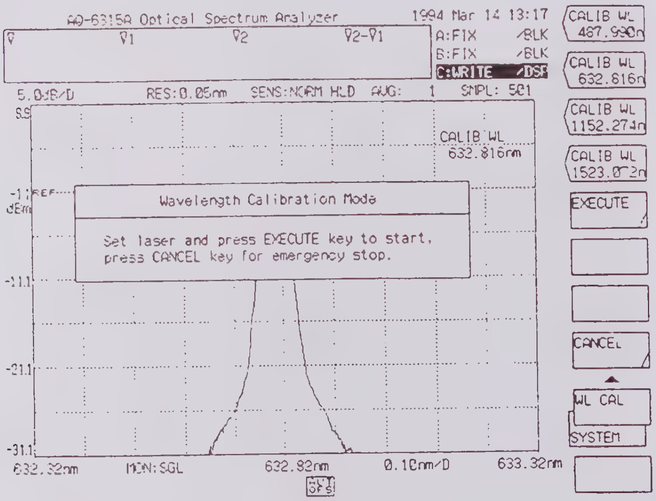
When the EXECUTE key is pressed, the absolute value of wavelength is calibrated with the selected or set wavelength.

The set value can be changed in the range of 350.000 to 1750.000 nm.

If the used laser is not in the range of ±5 nm to the set value, the absolute value is not calibrated.

*: *The soft key menu of ⑧ indicates the wavelength bands of helium-neon laser, etc. Accordingly, to calibrate the absolute value by the light source of displayed wavelength, use the soft key. However, in the soft key menu, wavelength is displayed either in air wavelength or vacuum wavelength depending on the setting on <MEAS WL AIR VAC> key.*

If the key is not found in the soft key menu, set the set value in the interrupt display section to the wavelength of the light source and calibrate the absolute value.



Wavelength Calibration Mode

Set laser and press EXECUTE key to start,
press CANCEL key for emergency stop.

When the <WL CAL> key is pressed:

CAUTION

- *In the following cases, wavelength calibration is disabled.*

  1) The level of the light source for calibration is less than −30 dBm.
  2) There is a difference between the light source for calibration and the set wavelength.
  3) The wavelength error of this equipment exceeds ±5 nm.
  In the case of 3), readjustment is required. Please ask us to make this readjustment.

- *Do not use this function to intentionally change the display wavelength. To do so, use the <WL SHIFT> key.*

NOTE

This function performed calibration for the whole wavelength area when offset is applied to the grading angle so that the error of the wavelength to be calibrated may be zero.
Accordingly, multiple wavelengths are not required for calibration. If multiple wavelengths have been calibrated, only the last calibration becomes effective.

(9) <WL SHIFT> key

Sets the amount of wavelength shift.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of –5.00 to 5.00 nm (0.01 step) by the rotary knob, step keys or ten-key pad.
After the amount of wavelength shift is set, the set value is added to the displayed value of wavelength axis.
This key is used to compensate differences in displayed wavelength wave among multiple measuring instruments.

When the offset value is not 0, WL SHF is displayed at the bottom of the screen.

(10) <LEVEL SHIFT> key

Sets the amount of level shift.
When this key is pressed, the current set value is displayed in the interrupt display section. The set value can be changed in the range of –30.00 to 30.00 dBm (0.01 step) by the rotary knob, step keys or ten-key pad.
After the amount of level shift is set, the set value is added to the displayed value of the level axis.
This key is used to compensate the loss of the isolator or filter connected to an external circuit.

When the offset value is not 0, LVL SHF is displayed at the bottom of the screen.

(11) <AUTO OFFSET> key

Sets whether or not to make an automatic offset adjustment for the AMP circuit.

When the <AUTO OFFSET> key is selected, an offset adjustment is periodically made for the internal AMP circuit.

When this key is not selected, no automatic offset adjustment is made. If this key is pressed in the unselected status, the key is selected and an offset adjustment is executed (immediately). After that, an automatic offset adjustment is made periodically.

CAUTION

If this key is kept in the unselected status, low input level waveforms becomes inaccurate when the measuring sensitivity is NORMAL (NORM RANG HOLD, NORM RANG AUTO).

Usually, use it in the selected status.

(12) <BUZZER> key

Sets the buzzer function.

This function determines whether or not to cause the buzzer to sound when a hard key or soft key is pressed or WARNING is displayed.

When this key is pressed, the soft key menu of ⑨ is displayed.

(13) <TEST MODE> key

Sets the test mode.

This key is used when this equipment is adjusted at plant, and is generally unusable.

When this key is pressed, the window for password setting is displayed but can be cleared by pressing another soft key or switch.

③

PLOT TRACE	Outputs waveforms (3 traces) at plotter output. (Toggle)
PLOT SCALE	Output the memory of waveform frame and wavelength axis/level axis at plotter output. (Toggle)
PLOT GRID	Outputs rules at plotter output. (Toggle)
PLOT CONDITION	Outputs measuring conditions, trace status, label, date and time at plotter output. (Toggle)
PLOT MARKER	Outputs the line marker, moving marker and data area at plotter output. (Toggle)
PLOT OTHERS	Outputs the interrupt display, mark display and soft keys at plotter output. (Toggle)
MORE 1/2	Display the soft key menu of ④.
RETURN	Returns to the soft key menu of ①.

△

COPY CONFIG
SYSTEM

④

PRINTER SAVE SPC	Sets the amount of paper feed at printer output. (Toggle)
PLOTTER ADRS 15	Sets the plotter address.
PEN SEL AUTO	Selects the pen number to be used by the plotter.
PLOTTER AUTO FEED	Performs automatic paper feed to the plotter. (Toggle)
MORE 2/2	Returns to the soft key menu of ③.
RETURN	Returns to the soft key menu of ①.

△

COPY CONFIG
SYSTEM

(14) <PLOT TRACE> key

Outputs waveforms (3 traces) when screen copy processing is performed by the plotter.
When this key is pressed, the key is selected and the above contents are executed.
Unless this key is selected, the waveforms are not output.

(15) <PLOT SCALE> key

Outputs a waveform frame and wavelength axis/level axis when screen copy is performed by the plotter.
When this key is pressed, the key is selected and the above contents are executed.
Unless the key is selected, the waveform frame and wavelength axis/level axis are not output.

(16) <PLOT GRID> key

Outputs grid when screen copy processing is performed by the plotter.
When this key is pressed, the key is selected and the above contents are output.
Unless the key is selected, the grid are not output.

(17) <PLOT CONDITION> key

Outputs the measuring conditions, trace status, label and date and time are output when screen copy is performed by the plotter.
When this key is pressed, the key is selected and the above contents are executed.
Unless the key is selected, the measuring conditions, trace status, label and date and time are not output.

(18) <PLOT MARKER> key

Outputs the line marker, moving marker and data area when screen copy is performed by the plotter.
When this key is pressed, the key is selected and the above contents are executed.
Unless the key is selected, the line marker, moving marker and data area are not output.

(19) <PLOT OTHERS> key

Outputs the interrupt display, mark display and soft keys when screen copy processing is performed by the plotter.
When this key is pressed, the key is selected and the above contents are executed.
Unless the key is selected, the interrupt display, mark display and soft keys are not output.

(20) <RETURN> key (COPY CONFIG)

Returns to the soft key menu of ①.

(21) <PRINTER SAVE SPC> key

Sets the amount of paper feed after screen copy processing is terminated by the printer.
When this key is pressed, the key is selected and the amount of paper feed is reduced.
Unless the key is selected, the amount of paper feed is set to the normal amount.

(22) <PLOTTER ADRS> key

Sets the address of X-Y plotter.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of 0 to 29 by the rotary knob, step keys or ten-key pad.

(23) <PEN SEL> key

Selects the pin number to be used by the X-Y plotter.

When this key is pressed, the current set value is displayed in the interrupt display section.

The set value can be changed in the range of AUTO and 1 to 9 by the rotary knob, step keys or ten-key pad.

When "AUTO" is set, automatic selection is performed as follows.

Output item	Used pen	Line type
Portion except waveform (except the trace status display)	PEN1	————————
Trace A (waveform and trace status display)	PEN2	————————
Trace B (waveform and trace status display)	PEN3	…………………
Trace C (waveform and trace status display)	PEN4	-·-·-·-·-·-·-

*:..... *Rules and markers are displayed by dotted line.*

(24) <PLOTTER AUTO FEED> key

Specifies whether or not to make the auto feed function of the X-Y plotter effective.

When this key is selected, automatic paper feed is performed to the X-Y plotter.

Unless the key is selected, automatic paper feed is not performed. At that time, feed paper manually before starting the plotter.

This key is effective when the X-Y plotter is provided with an automatic paper feed function (e.g., Hp7550A). In case of a plotter without this function, if this key is pressed, automatic paper feed is not performed.

By selecting a soft key of (13) to (18), the screen information of this equipment can be output in the format fit for use. When all the keys of (13) to (18) are selected, all the information displayed on the screen is output to the X-Y plotter.

⑤

CURSOR →	Moves the cursor in the window for built-in clock setting to the right.
YR-MO-DY	Sets the date display in the upper right part of the screen and the window to "year-month-day".
MO-DY-YR	Sets the date display in the upper right part of the screen and the window to "month-day-year".
DY-MO-YR	Sets the date display in the upper right part of the screen and the window to "day-month-year".
RETURN	Returns to the soft key menu of ①.

△
SET CLOCK
SYSTEM

⑥

DEFAULT COLOR 1	Selects one of the preset 5 patterns as a display color.
MANUAL COLOR	Sets the display color to the desired color for each portion.
RETURN	Returns to the soft key menu of ①.

△
SET COLOR
SYSTEM

(25) <CURSOR → > key

Moves the cursor in the window displayed by the <SET CLOCK> key to the right.
(When the cursor is at the right end, it is moved to the left end.)

(26) <YR – MO – DY> key

Sets the date display method in the upper right part of the screen and the window to "year-month-day".

(27) <MO – DY – YR> key

Sets the date display method in the upper right part of the screen and the window to "month-day-year".

(28) <DY – MO – YR> key

Sets the date display method in the upper right part of the screen and the window to "day-month-year".

(29) <RETURN> key (SET CLOCK)

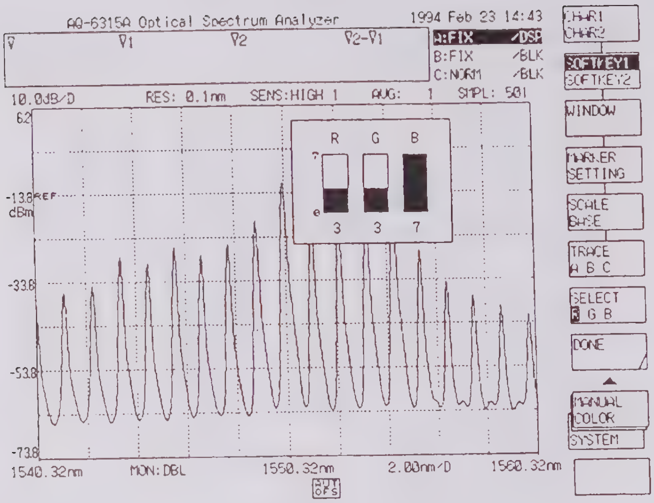
Clears the window and returns to the soft key menu of ①.

(30) <DEFAULT> key

Selects one of the preset 5 patterns as a display color.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of 1 to 5 by the rotary knob, step keys or ten-key pad.

(31) <MANUAL COLOR> key

Sets the display color to the desired color.
Color setting can be performed for each portion.
When this key is pressed, the soft key menu of ⑦ and the window for color setting by RGB video signals are displayed. In the soft key menu of ⑦, specify the portion to be changed (one out of twelve). The ratio of R (red)/G (green)/B (blue) in the window for color setting in the range of 0 to 7 by the rotary knob, step keys or ten-key pad. A total of 512 combinations can be displayed. As soon as the setting is changed, the color is changed.



When the <MANUAL COLOR> key is pressed:

(32) <RETURN> key (SET COLOR)

Returns to the soft key menu of ①.

⑦

CHAR 1 CHAR 2	Specifies the normal characters or the WARNING characters as display color change.
SOFTKEY 1 SOFTKEY 2	Specifies the effective soft key or ineffective soft key/mark display as display color change.
WINDOW	Specifies the window frame as display color change.
MARKER SETTING	Specifies the marker or mark display as display color change.
SCALE BASE	Specifies the scale or background color as display color change.
TRACE A B C	Specifies the trace A, trace B or trace C as display color change.
SELECT R G B	Sets the ratio of R/G/B in changing the display color. (Toggle)
DONE	Returns to the soft key menu of ①.
△	
MANUAL COLOR	
SYSTEM	

⑧

CALIB WL 487.990n	Sets the reference wavelength for wavelength calibration to 487.990 nm or 488.123 nm.
CALIB WL 632.816n	Sets the reference wavelength for wavelength calibration to 632.816 nm or 632.991 nm.
CALIB WL 1152.274n	Sets the reference wavelength for wavelength calibration to 1152.274 nm or 1152.589 nm.
CALIB WL 1523.072n	Sets the reference wavelength for wavelength calibration to 1523.072 nm or 1523.488 nm.
EXECUTE	Executes wavelength calibration.
CANCEL	Stops wavelength calibration. (To ②)

△

WL CAL

SYSTEM

(33) <CHAR 1 CHAR 2> key

Specifies the normal characters or WARNING characters as display color change.

When this key is pressed, the display in reverse video is switched between "CHAR1" and "CHAR 2".

When "CHAR 1" is selected, the normal character color is specified.

When "CHAR 2" is selected, the WARNING character color is specified.

(34) <SOFTKEY 1 SOFTKEY 2> key

Specifies the effective soft key, ineffective soft key or mark display at the ineffective time as display color change.

When this key is pressed, the display in reverse video is switched between "SOFTKEY 1" and "SOFTKEY 2".

When "SOFTKEY 1" is selected, the effective soft key color is specified.

When "SOFTKEY 2" is selected, the ineffective soft key or mark display at the ineffective time is specified.

(35) <WINDOW> key

Specifies the window frame as display color change.

Each time this key is pressed, select and select clear are repeated alternately.

When this key is selected, the window frame color is specified.

(36) <MARKER SETTING> key

Specifies the marker or mark display as display color change.

When this key is pressed, the display in reverse video is switched between "MARKER" and "SETTING".

When "MARKER" is selected, the marker color is specified.

When "SETTING" is selected, the mark display color is specified.

(37) <SCALE BASE> key

Specifies the scale or background color as display color change.

When this key is pressed, the display in reverse video is switched between "SCALE" and "BASE".

When "SCALE" is selected, the scale color is specified.

When "BASE" is selected, the background color is specified.

(38) <TRACE A B C> key

Specifies the trace A, B or C as display color change.

When this key is pressed, the display in reverse video is changed in rotation in the order of "TRACE A", "TRACE B", "TRACE C" and "TRACE A".

When "TRACE A" is selected, the trace A color is specified.

When "TRACE B" is selected, the trace B color is specified.

When "TRACE C" is selected, the trace C color is specified.

(39) <SELECT> key

Sets the ratio of R/G/B in changing the display color.

When this key is pressed, the display in reverse video is changed in rotation in the order of "SELECT R", "SELECT G", "SELECT B", SELECT R", and the display in reverse video in the parameter section (R/G/B) in the window for color setting moves.

When "SELECT R" is selected, Red is specified.

When "SELECT G" is selected, Green is specified.

When "SELECT B" is selected, Blue is specified.

(40) <DONE> key

Returns to the soft key menu of ①.

(41) <CALIB WL ****.*** n> key

Sets reference wavelength used for wavelength calibration to *****.***nm. (****.*** represents wavelength value shown in the soft key menu.) Interrupt display section shows reference wavelength being set to *****.***nm. To change the setting, set reference wavelength to wavelength of light source by pressing another soft key or using the rotary knob, step keys or ten-key.

Wavelength calibration is available both in air wavelength or vacuum wavelength.

Therefore, wavelength shown in the soft key menu varies depending on which setting is selected.

Prior to the calibration, either air wavelength or vacuum wavelength must be selected and its setting must be done accordingly using above mentioned (7) <MEAS WL AIR VAC> key (→P. 5-107).

Wavelength shown in the soft key menu varies according to the mode used.

(unit: nm)

Air wavelength mode	Vacuum wavelength mode
487.990	488.123
632.816	632.991
1152.274	1152.589
1523.072	1523.488

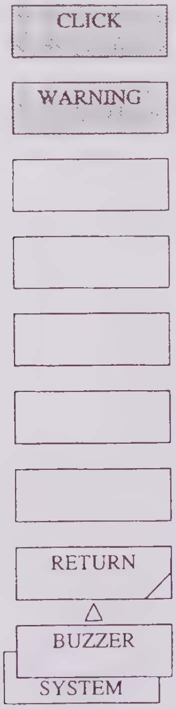
(42) <EXECUTE> key

Executes wavelength calibration with the set wavelength.
During the execution, the window is continuously displayed and this key is displayed in reverse video.
After completion of wavelength calibration, the window disappears and the soft key menu of ② is displayed again.
At this time, the screen displays the waveforms precedent to pressing the <WL CAL> key.
If execution could not be attained, WARNING is displayed.

(43) <CANCEL> key

After completion of wavelength calibration, the window disappears and the soft key menu of ② is displayed again.

⑨



Sets whether or not generate a click sound. (Toggle)

Sets whether or not to generate a warning sound upon occurrence of WARNING. (Toggle)

Returns to the soft key menu of ②.

(44) <CLICK> key

Sets whether or not to generate a click sound when a panel switch or soft key is pressed.
Each time this key is pressed, select or select clear is repeated alternately.
When this key is selected, click sound generation is set.

(45) <WARNING> key

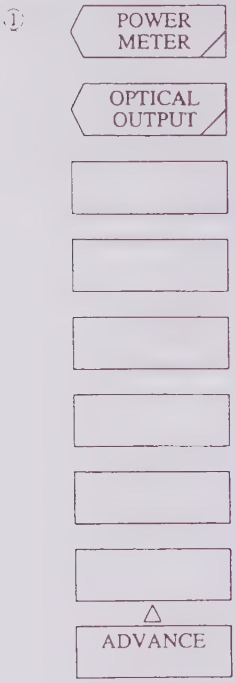
Sets whether or not to generate a warning sound upon occurrence of WARNING etc.
Each time this key is pressed, select or select clear is repeated alternately.
When this key is selected, warning sound generation is set.

(46) <RETURN> key (BUZZER)

Returns to the soft key menu of ②.

5.1.15 [ADVANCE] switch

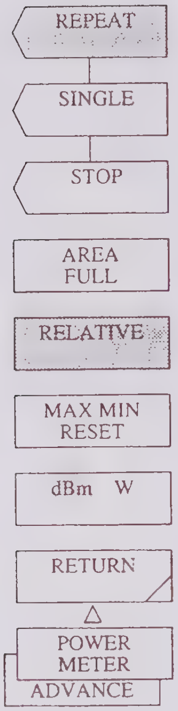
This switch executes the power meter function and optical output function (AQ-6315B only).
When this switch is pressed, the soft key menu of 1 is displayed.



POWER METER ······ Sets the power meter mode. (To ②)

OPTICAL OUTPUT ······ Sets the optical output mode. (To ③)

②



REPEAT	Makes repeat measurement in the power meter mode.
SINGLE	Makes single measurement in the power meter mode.
STOP	Stops measurement.
AREA FULL	Sets the measuring range in the power meter mode.
RELATIVE	Switches the power display value between absolute value and relative value. (Toggle)
MAX MIN RESET	Resets the maximum value and minimum value.
dBm W	Selects the unit of power measurement value (dBm or W). (Toggle)
RETURN	Returns to the soft key menu of ①
POWER METER ADVANCE	

(1) <POWER METER> key

Sets the power meter mode.
When this key is pressed, the window and the soft key menu of ② are displayed.

For the power meter function, refer to 5.2.3.

(2) <OPTICAL OUTPUT> key (AQ-6315B only)

Sets the optical output mode.
When this key is pressed, the window and the soft key menu of ③ are displayed.

For the optical output function, refer to 5.2.4.

(3) <REPEAT> key

Makes repeat measurement in the power meter mode and displays the result in the window.
When this key is pressed, the soft key is selected and a repeat measurement is started.

(4) <SINGLE> key

Makes single measurement in the power meter mode.
When this key is pressed, the soft key is selected and single measurement is started.
After measurement is made and its result is displayed in the window, the <STOP> key is selected.

(5) <STOP> key

Stops measurement in the power meter mode.

(6) <AREA> key

Sets the measuring range in the power meter mode.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of FULL, 350 to 700, 600 to 1000 and 1000 to 1750 by the rotary knob, step keys or ten-key pad. The "FULL value represent the range of 350 to 1750 nm.

(7) <RELATIVE> key

Switches the power display value in the window between absolute value and relative value.
Each time this key is pressed, select or select clear is repeated alternately.
When this key is selected, the display value in the window is set to relative value.
Unless this key is not selected, the display value in the window is set to absolute value.
The relative value in the selected status is set at 0 dB.

(8) <MAX MIN RESET> key

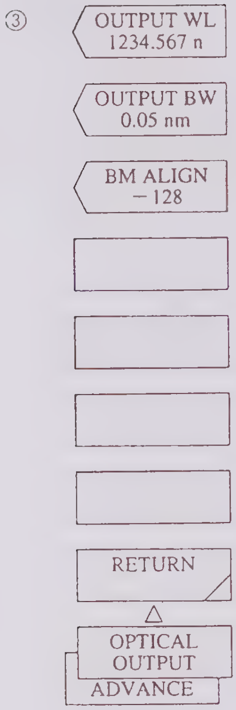
Resets the MAX value and MIN value displayed in the window by the power meter function.
By pressing the key, the maximum value and minimum value are reset.

(9) <dBm W> key

Selects LOG value (dBm) or linear value (W) for power measurement result display.
Each time this key is pressed, the display in reverse video is switched between "dBm" and "W"
When "dBm" is selected, LOG value is specified.
When "W" is selected, linear value is specified.

(10) <RETURN> key (POWER METER)

Closes the window and returns to the soft key menu of ①.
The screen displayed by pressing the <POWER METER> key is displayed again.



OUTPUT WL …… Sets the wavelength for optical output.

OUTPUT BW …… Sets the band width (resolution) at optical output.

BM ALIGN …… Masks a fine adjustment of the optical axis position at optical output.

RETURN …… Close the window and returns to the soft key menu of ①.

(11) <OUTPUT WL> key (AQ-6315B only)
Sets the wavelength for optical output.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of 350.00 to 1750.00 nm (0.001 step) by the rotary knob, step keys or ten-key pad.

(12) <OUTPUT BW> key (AQ-6315B only)
Sets the band width (resolution) at optical output.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of 0.05 to 10 nm (1, 2 or 5 steps) by the rotary knob, step keys or ten-key pad.

(13) <BW ALIGN> key (AQ-6315B only)
Makes a fine adjustment of the optical axis position at optical output.
When this key is pressed, the current set value is displayed in the interrupt display section.
The set value can be changed in the range of –200 to 200 (1 step) by the rotary knob, step keys or ten-key pad.

(14) <RETURN> key (OPTICAL OUTPUT)
Closes the window and returns to the soft key menu of ①.
The screen displayed by pressing the <OPTICAL OUTPUT> key is displayed again.

5.1.16 [USER] switch

Soft keys that are to be frequently used can be registered in the soft key menu displayed by this switch.
The soft key menu includes 1/3 to 3/3 and unregisted soft keys remain blank. When a soft key is pressed, the operation corresponding to the registered contents is performed.
For the procedure for registration, refer to 5.1.14 [SYSTEM] switch, <USER KEY DEFINE> key.

5.1.17 [HELP] switch

When this switch is pressed, the explanation of the soft key menu displayed at that time is displayed.
If the soft key menu is changed by pressing a panel switch or soft key, the explanation is also changed accordingly. (The function is not executed.)
The WARNING/ERROR message display area is provided at the bottom of the help message list and displayed the contents of the occurring warning/error.
To quit the help screen and return to the initial screen, press the auxiliary key <QUIT HELP> key (displayed at the bottom of the soft key menu).

5.1.18 [COPY] switch

When this switch is pressed, hard copies or lists are output to the printer or plotter in accordance with the screen. (They are output from the printer or plotter depending on the select status of the <COPY KEY PTR PLTR> key displayed by pressing the [SYSTEM] switch.)
In case of hard copies, the contents of output is selected by the <COPY CONFIG> key displayed by pressing the [SYSTEM] switch.
By pressing the auxiliary key <COPY CANCEL>, the copy operation is stopped.
The usage of the printer and plotter is shown below.

- For outputting hard copies of screens by the printer:
  (When the <COPY KEY PTR PLTR> key of the [SYSTEM] switch is selected to "PTR":)

  (1) When the [COPY] switch is pressed, a hard copy of the screen displayed at that time is output from the printer.

  (2) When the [COPY] switch is pressed in the sweep status, the sweep is stopped and printing is performed. After that, a sweep is started again.

  (3) The amount of paper feed after printing is set by the <COPY CONFIG> key displayed by pressing the [SYSTEM] switch.

(4) When record paper is used up during printing or when the [COPY] switch is pressed without setting record paper, the warning "Printer paper empty" is displayed.
When the [COPY] switch is pressed with the head-up lever set at [UP], the warning "Printer head up" is displayed.
By pressing the [COPY] switch after setting record paper or set the head-up lever to [DOWN], printing is started.

(5) Set record paper according to the following procedure.
   1) Open the cover on the top face plate of this equipment and set the record paper in the paper holder. At this time, set it so that the outside face may look upward when the end of record paper is opened outward.
   2) Set the head-up lever to the [UP] side. If any record paper chip is left, remove it and insert the end of the record paper set in 1) as indicated in Fig. 5-2.
   Then, feed it by 5 cm or so. (Refer to Fig. 5-2.)
   3) Set the head-up lever to the DOWN side. Continue to press the [FEED] switch until record paper comes out from the record paper slit on the top face plate.
   4) Close the cover of the top face plate.

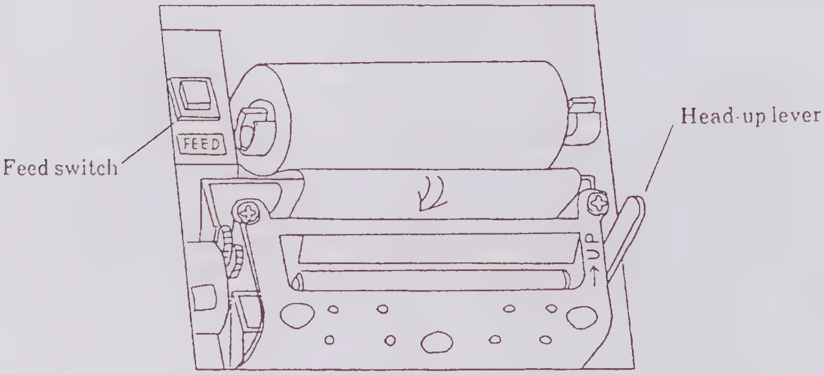


Fig. 5-2 Setting Record Paper

- For outputting hard copies of screens by the plotter:
  (When the <COPY KEY PTR PLTR> key of the [SYSTEM] switch is set to "PLTR":)

(1) Prepare the X-Y plotter to be used.
The X-Y plotters conforming to the HP-GL standard are usable.

(2) Connect the X-Y plotter to the connector [GP-IB 2] on the rear side of this equipment by using the GP-IB cord.
Before making this connection, turn off their power supplies.

(3) Cause the equipment to display a measured waveform to be output to the X-Y plotter.

NOTE

> *The [COPY] switch can be pressed only when a waveform is displayed on the screen in the sweep stop status.*

(4) Press the <PLOTTER ADRS> key displayed by the <COPY CONFIG> key of the [SYSTEM] switch and set the GP-IB address of the X-Y plotter to be used.
(Refer to 5.1.14 [SYSTEM] switch, <PLOTTER ADRS> key.)
When the X-Y plotter is set to the listen only mode, a desired number of GP-IB addresses can be set.

(5) Press the <COPY CONFIG> key of the [SYSTEM] switch and select the items to be output to the X-Y plotter in the displayed soft key menu. By selecting several keys out of the 6 soft keys, any desired combination can be output.
If all the 6 soft keys are selected, all the information displayed on the screen is output to the X-Y plotter.
In case this equipment makes an overlap display, only the waveform lastly recalled is output.
(Refer to 5.1.14 [SYSTEM] switch, <COPY CONFIG> key.)
Table 5-2 shows the contents of each item.
After completion of output item setting, press the <RETURN> key.

Table 5-2 Output Item Setting (1/2)

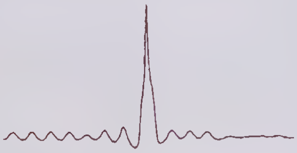
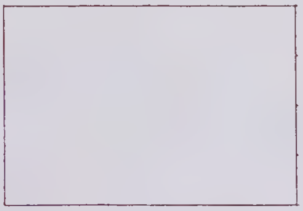
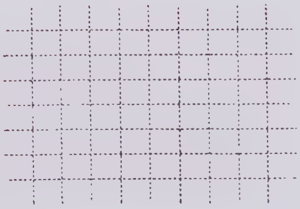
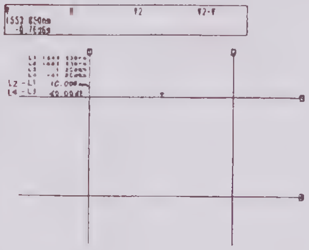
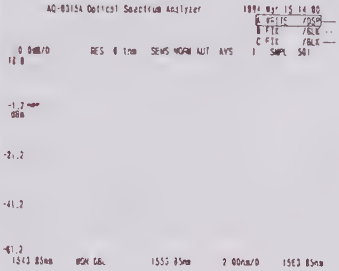
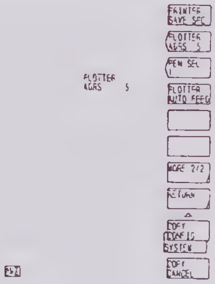
Soft key	Output item	Example of X-Y plotter output
<PLOT TRACE> key	Outputs only the waveform displayed on the screen.	
<PLOT SCALE> key	Output only the memory of the waveform frame and waveform axis/level axis displayed on the screen.	
<PLOT GRID> key	Outputs only the grid displayed on the screen.	

Table 5-2 Output Item Setting (2/2)

Soft key	Output item	Example of X-Y plotter output
<PLOT CONDITION> key	Outputs only the measuring conditions, trace status, label and date and time displayed on the screen.	
<PLOT MARKER> key	Outputs only the line marker, moving marker, data area displayed on the screen.	
<PLOT OTHERS> key	Outputs the interrupt display, mark display and soft keys displayed on the screen.	 PRINTER SAVE SEC PLOTTER ADRS 5 PEN SEL 1 PLOTTER AUTO FEED MORE 2/2 RETURN COPY CONFIG SYSTEM COPY CANCEL PLOTTER ADRS 5

(6) Press the <PEN SEL> key displayed by the <COPY CONFIG> key of the [SYSTEM] switch and set the pen to be used by the X-Y plotter. (Refer to 5.1.14 [SYSTEM] switch, <PEN SEL> key.)

(7) When the X-Y plotter is provided with an automatic paper feed function (e.g., HP7550A), select the <PLOTTER AUTO FEED> key displayed by pressing the <COPY CONFIG> key of the [SYSTEM] switch. With this, automatic paper feed is performed to the X-Y plotter.
(Refer to 5.1.14 [SYSTEM] switch, <PLOTTER AUTO FEED> key.)

(8) When the [COPY] switch is pressed, plot processing is started by the X-Y plotter.
To stop this processing, press the auxiliary key <COPY CANCEL>. Then, the X-Y plotter stops.

(9) When any error occurs in the plot status, the following WARNING is displayed.

1) Message : "Output mode unsuitable"
Contents : At X-Y plotter output, plot processing was tried without selecting any output item on the screen.
Action : Select one or more output items on the screen.

2) Message : GP-IB Error"
Contents : There is a difference between the X-Y plotter address set in this equipment and the address set on the X-Y plotter side or an GP-IB error occurred.
Action : Match the X-Y plotter address to be set by the <PLOTTER ADRS> key with the address on the X-Y plotter side.

3) Message : "Plotter error"
Contents : An error occurred on the X-Y plotter side.
Action : Check if there is any incorrect setting on the X-Y plotter side.

4) Message : "Plot mode unsuitable"
Contents : The displayed screen cannot be output to the plotter.
Action : Only displayed waveforms can be plotted. For plotting, display a waveform display screen.

(10) The X-Y plotters shown in Table 5-3 are recommendable for use.

Table 5-3 List of X-Y Plotters Recommendable Product

Product name	Marker	Paper size	Drafting speed
HP7440A	Hewlett Packard Co.	A4	400 mm/sec max.
HP7475A	Hewlett Packard Co.	A3/A4	381 mm/sec max.
HP7550A	Hewlett Packard Co.	A3/A4	800 mm/sec max.

5.1.19 [FEED] switch

When this switch is pressed, printer paper feed is performed.
While this switch is continuously pressed, paper feed is continued.

5.1.20 [AUXILIARY] switch

This switch (displayed at the bottom of the soft key menu) is provided with a different key display and function depending on the screen status (function in the execute status).
The different functions depending on the screen status are shown below.

Screen status	Key display	Function
a) When the UNDO function is effective:	UNDO	Parameter setting/change and data change/deletion are displayed after completion of execution. When the key is pressed, the result previously executed is canceled and the status precedent to the execution is set.
b) When a program is executed:	PROGRAM EXIT P03	The program in execution is stopped and the soft key menu of the panel switch lastly executed is displayed. "P03" of the auxiliary key denotes the program number in execution.
c) When a user key is registered:	KEY DEF DONE	The soft key menu displayed by pressing the [SYSTEM] switch upon completion of the user key registration mode is displayed again. The screen becomes the status displayed by pressing the <USER KEY DEFINE> key.
d) When the HELP screen is displayed:	QUIT HELP	The HELP message widnow is closed and the screen displayed by pressing the [HELP] switch is displayed again.
e) When the COPY function is executed:	COPY CANCEL	The copy operation is stopped and the screen displayed by pressing the [COPY] switch is displayed again.
f) When the GP-IB is in the remote status:	LOCAL	The remote status is reset to the local status.

5.2 Detailed Description of Measuring Functions

5.2.1 Pulse light measuring function

1. Outline

This equipment is provided 3 types of pulse light measuring function.

1) LPF mode

Setting method:

Press [SET UP] <PLS LIGHT MEASURE> <LPF MODE>.

Function:

Pulse light is averaged by a low-pass filter. The mean level of pulse light can be measured. Pulse light with a repeat frequency of about 5 kHz or more (cycle 200 µs or less) can be measured.

When the number of averaging times (set by [SETUP] <AVERAGE TIMES> is increased, lower repeat frequencies can be measured.

When the number of averaging times is n, the measurable lowest repeat frequency is about $5/\sqrt{n}$ kHz.

The measuring level is the mean level of pulse light. For example, when pulse light is perfectly square, the measuring level is (peak level of pulse light) × (duty of pulse light). Accordingly, as the duty of pulse light is smaller, the measuring level becomes lower.

2) Peak hold mode

Setting method:

Press [SETUP] <PLS LIGHT MEASURE> <PEAK HOLD> and enter the hold time (HOLD TIME) by the ten-key pad.

Function:

The peak level of pulse light is measured.

Pulse light with a repeat frequency of 0.1 Hz or more (cycle 10 sec or less) can be measured.

The measurable minimum pulse width is 30 µs. However, when the pulse width is less than 100 µs, the measuring level becomes inaccurate.

In the peak hold mode, the hold time (peak detect time) for each measuring point is set. The hold time must be set longer than the repeat frequency of pulse light.

3) External trigger mode

Setting method:

Press [SETUP] <PLS LIGHT MEASURE> <EXT TRG MODE>.

Function:

By inputting a control signal synchronized with measured light to the SMPL TRG IN terminal or SMPL ENBL IN terminal from an external circuit, measurement can be made with desired timing.

The SMPL TRG IN terminal (Measurement trigger input terminal) is an TTL-level nagative-logic input terminal. Each time a trailing edge of an input signal is detected, each measuring point is measured. Accordingly, to terminate a sweep, the number of trigger signals equal to the number of samples (set by [SETUP] <SAMPLING POINT>) is required.
The SMPL ENBL IN terminal (measurement enable input terminal) is a TTL-level nagative-logic input terminal. Only for the period in which a LOW level of an input signal is detected, measurement is made. Unlike the EXT TRIG IN terminal, while the signal is LOW, measurement is continued one after another.
In the external trigger mode, the maximum response frequency is 5 kHz.
The delay time from trigger signal detection till measurement is about 25 μs.
If a trigger signal is input while the wavelength is changed to the next measuring point after completion of measurement at each point (approx. 10 to 30 ms), it is ignored.
Both SMPL TRG IN terminal and SMPL ENBL IN terminal are internally pulled up.
Accordingly, they can be caused to go high in the open status and low in the GND short status.

2. How to use each mode properly
For pulse light with a repeat frequency of 10 kHz or less, the peak hold mode is suitable.
When the repeat frequency exceeds 10 kHz, the LPF mode is suitable.
The external trigger mode is used to know an optical spectrum at an optional timing when the light source level and wavelength characteristic vary cyclically.
(The variation speed must be followed up at the maximum response frequency of 5 kHz.)

3. When the pulse light measuring function is not used:
Even when the pulse light measuring function is not used, measurement is possible if the repeat frequency of pulse light is high to some extent. In this case, like the LPF mode, mean level measurement is made.
The measurable repeat frequency depends on the measuring sensitivity (set by [SETUP] <SENS>)

1) When the measuring sensitivity is set to SENS:NORM:
Pulse light with a repeat frequency of 100 kHz or more can be measured.
When the number of averaging times (set by [SETUP] <AVERAGE TIMES>) is increased, lower repeat frequencies can be measured.
When the number of averaging times is set to n, the measurable lowest frequency is about $100/\sqrt{n}$ kHz.

2) When the measuring sensitivity is set to SENS:HIGH1 to 3:
Pulse light with a repeat frequency of 1 kHz or more can be measured.
Even if the number of averaging times is increased, the measurable lowest frequency is the same.

NOTE

> *SWP TRG IN terminal*
>
> *Unlike the SMPL TRG IN terminal, the SWP TRG IN terminal (sweep trigger IN terminal) is a TTL-level negative-logic input terminal and starts a sweep by a trigger signal. When a trigger signal is received, the terminal functions in the same way as pressing [SWEEP] <SINGLE>. This terminal, which is independent of the pulse light measuring function, can function in any mode.*

5.2.2 External chop function

1. Outline

   When the measuring sensitivity is set to HIGH1 to 3, the internal optical chopper is activated and makes input light intermittent at 270 Hz.
   The signal detecting section takes out only the 270 Hz component for measurement.
   With this operation, the offset drift of the signal detecting section is canceled.
   When the external chop function is used, modulation can be externally performed instead of the internal optical chopper.
   When measured light consisting of multiple pieces of light, the optical spectrum of a specific light source can be measured by modulating only this light source among them.

2. Setting method

   Press the [SETUP] switch and the <SENS> key, and then set SENSITIVITY (measuring sensitivity) to any of HIGH1 to 3.
   Next, press the [SETUP] switch and the <CHOP> key and select EXT for the <CHOP> key.

3. External modulation method and conditions

   In the external chop mode, the reference signal (TTL level) for modulation is output to the [EXT CHOP OUT] terminal at rear panel.
   With this signal, modulate input light so that the measured light may emit light at the LOW level and may not emit light at the HIGH level.
   The phase difference between the reference signal and input light modulation must be less than ±5° (±50 µs).
   In the external chop mode, light components that have not undergone modulation in synchronization with the reference signal are not measured.
   However, if the level of unmodulated components is too high, the internal signal detecting circuit is saturated with the result that accurate measurement becomes impossible.
   When the level of unmodulated components per resolution is less than –40 dBm, this does not matter.
   When it exceeds –40 dBm, the level must be lower than the peak level of the modulated component.

5.2.3 Power meter function

1. Outline

   In this equipment, the following measurement is made in the power meter mode.

   In the power meter mode, a sweep is internally performed in the wavelength range set by the <AREA> key at a resolution of 10 nm for spectrum measurement. For a measured spectrum, power measurement is made and the result is displayed in the window.

   At this time, the spectrum internally measured, which have undergone wavelength sensitivity compensation, permits power measurement free from wavelength dependency.

   Power variation can be measured by switching between relative value and absolute value by the <RELATIVE> key. In the window, there is a function to display the maximum value and minimum value levels which can be initialized by the <MAX MIN RESET> key.

   As a power unit, "dBm" and "W" can be selected by the <dBm W> key.

2. Setting method

   When the [ADVANCE] switch and the <POWER METER> key are pressed, the power meter mode is set.

   Then, set the measuring range to any of FULL (350 to 1750 nm), 350 to 700, 600 to 1000, and 1000 to 1750 by the <AREA> key.

5.2.4 Optical output function (AQ-6315B only)

1. Outline

   The light component of the wavelength value (allowable setting range: 350.000 to 1750.000 nm (0.001 step)) displayed on the <OUTPUT WL> key is output from the connector [OPTICAL OUTPUT].

   At this time, the set wavelength is included in the wavelength axis displayed on the screen, the wavelength line marker is displayed and moves according to changes of the set wavelength.

   The band width of the light component to be output can be set in the range of 0.05 to 10.0 nm by the <OUTPUT BW> key.

   The <BM ALIGN> key used for optical axis adjustment with the internal fiber.

   Basically, optical axis adjustment is already finished at shipment. However, if the optical axis is shifted by temperature change or secular change, adjust it by this key so that the output level may be maximized.

2. Setting method

   Press the [ADVANCE] switch and the <OPTICAL OUTPUT> and <OUTPUT WL> keys and set the wavelength for optical output.

   Next, press the <OUTPUT BW> key and set the band width for optical output.

5.2.5 Analog output function

1. Outline

   To the ANALOG OUT terminal, the electric signals proportional to the measuring level are output in real time upon execution of a sweep. (0 to 5 V, load impedance 1 kΩ or more)

   To the SMPL TRG OUT terminal, trigger pulses are output according to the timing with which measurement at each measuring point is made during a sweep.

   (TTL level, nagative logic, pulse width approx. 15 μs)

2. Remarks

   - The output signal of the ANALOG OUT terminal cannot undergo wavelength sensitivity compensation unlike the waveforms displayed on the screen.

   - Use the ANALOG OUT terminal in the measurement mode: CW light measurement (press [SETUP] <CW LIGHT MEASURE>) with the measuring sensitivity: NORM RANGE HOLD (set by [SETUP] <SENS>).

     In the other setting conditions, the output signals of the ANALOG OUT terminal and SMPL TRG OUT terminal do not correspond to screen displays.

   - When the number of averaging times is set to more than 1, to the SMPL TRG out terminal, the same number of trigger pulses as the number of averaging times is output to the same measuring point.

5.2.6 Power density display function

The level axis of the optical spectrum analyzer represents the absolute power in a single resolution.
If the resolution is set to 0.1 nm, for example, the power in 0.1 nm is displayed.

If a gas laser or a semiconductor laser is used, its optical spectrum is narrower than the resolution of this Analyzer and, therefore, the entire power can be displayed within a single resolution bandwidth.
The measured power (that is, the peak level) matches the total power of the optical source.
This Analyzer has been calibrated to accurately display the power in such conditions.

While the natural sun light, fluorescent lamps, and LEDs often have the spectrum width wider than the setup resolution of this Analyzer. If these lights are measured by this Analyzer, the measured power is changed depending on the resolution setup.

The actual resolution of the optical spectrum analyzer does not completely match the setup resolution.
For example, if the resolution is set to 0.1 nm on this Analyzer, the actual resolution may reach 0.07 nm in the 1550-nm band. This complicates the determination of relationship between the measured value and absolute value when a wide range optical spectrum is measured.

In addition, as the Analyzer changes the diffraction order at 600 nm (or 650 nm), the actual resolution line does not continue before and after this point. Therefore, the optical spectrum has a certain step when an optical source having this wavelength is measured (see Section 10.3.7).

To solve such problems, the Analyzer can switch the level axis display from the absolute power of a single resolution (dBm, mW, µW, nW or pW) to the power density (dBm/nm, mW/nm, µW/nm, nW/nm, or pW/nm) by the <dBm dBm/nm> key.

During power density display, the measured values are converted into the power of 1 nm and displayed. Therefore, the fixed power density can always be displayed even when any resolution is selected for measurement. Also, there is no step of optical spectrum.

The absolute power display or the power density display can be selected in the following applications:

Absolute power display : For measurement of an optical source which has a narrow spectrum width (examples of gas laser and semiconductor laser).
Power density display : For measurement of the natural light and LEDs having the wide spectrum width.

If the trace subtraction function is used for "A–B(A/B) → C" and for "B–A(B/A) → C" modes, the results are not different between the absolute power display and power density display.

As the power measurement function and the color analysis function use the different calculation methods depending on their level axis display, these functions can output the correct results in both display modes.

Also, if the NF measurement function (by the <ANALYSIS2 EDFA-NF> key) and the WDM analysis function (by the <ANALYSIS2 WDM> key) are executed, the level axis is forcibly changed to the absolute power display mode.

NOTE

The Analyzer specifications such as level accuracy, measurement level range, and level linearity have been defined for the absolute power display.

5.3 Detailed Description of Analysis Function

5.3.1 NF measuring function

1. Outline

The NF function measures NF (noise figure) of the optical fiber amplifier.

Optical spectrum of signal light is entered to the trace A and, for the trace B, optical spectrum of signal light after being amplified by optical fiber amplifier is entered. Then this function is executed.

With this, the following items are calculated and the results are displayed in the data area.

ASE (amplified spontaneous emission) level
Gain
NF

For ASE calculation, the data of the trace B is used. At this time, the optical spectrum of signal light must be masked.

The mask range can be set freely.

As the measuring resolution at ASE level measurement, required for NF calculation, the half-width level of optical spectrum before amplification is measured and the result is applied.

The mask range and measuring resolution are displayed together.

Level offset can be applied to both optical spectrum before amplification and after amplification. Th operation makes up possible loss due to isolator or photo coupler being installed on optical fiber amp

2. Operations

1) Set the trace A to WRITE and measure the optical spectrum of signal light (light entering the optical fiber AMP). After the measurement, set the trace A to FIX.

2) Set the trace B to WRITE and measure the optical spectrum of output light (light amplified by the optical fiber AMP). After the measurement, set the trace B to FIX.

3) Press the [ANALYSIS] switch and the <EDFA NF> key.

4) NF measurement function is executed and results are shown in data area.
Following soft keys are also shown. Press desired key and enter parameters using the rotary knob, step keys or ten-key.

• <OFST (IN)> key	Level offset of input spectrum
• <OFST (OUT)> key	Level offset of output spectrum
• <PLUN MSK> key	Mask range at ASE calculation (Right side of signal light's peak wavelength)
• <MINUS MSK> key	Mask range at ASE calculation (Left side of signal light's peak wavelength)

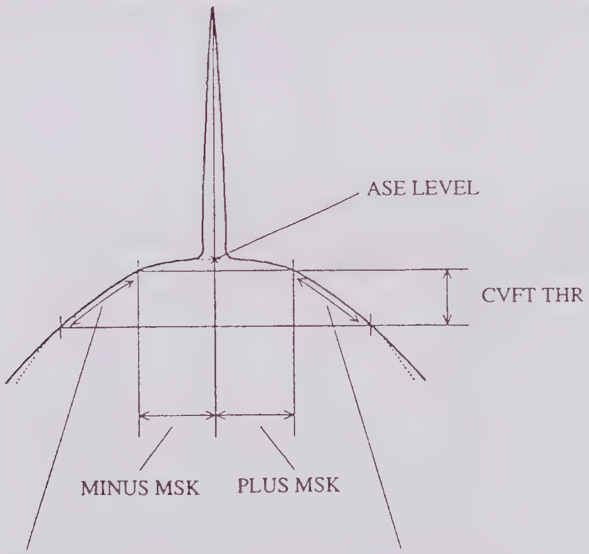
- <CVFT TYPE> key .... Approximation expression of ASE curve
  GAUSSIAN : Normal distribution curve
  LORENZIAN : Lorenz curve
  3RD POLY : Cubic expression
  4TH POLY : Biquadratic expression
  5TH POLY : Pentagonal expression
- <CVFT THR> key .... Threshold when ASE curve is approximated

3. Calculation method

1) ASE level PASE

For the data in the section from the waveform data of the trace B to Value corresponding to threshold (being set with <CVFT THR> key) lower on both sides than the position of "peak wavelength ± mask range" (setting is done with <PLUS MSK> or <MINUS MSK> key), perform approximation by function specified with <CVFT TYPE> key.

Next, find the peak wavelength of the trace B and specify the peak wavelength level of the approximation curve as ASE level PASE.



Approximation is conducted on the data within this range.
Approximation expression is per <CVFT TYPE> key.

When the approximation curve is found, the whole waveform of the trace B is usually approximated. However, if the wavelength line marker is set by [MARKER] <LINE MARKER 1> and <LINE MARKER 2> and put [MARKER] <SEARCH L1-L2> into the select status, only the range enclosed by the line markers is approximated.

2) gain G

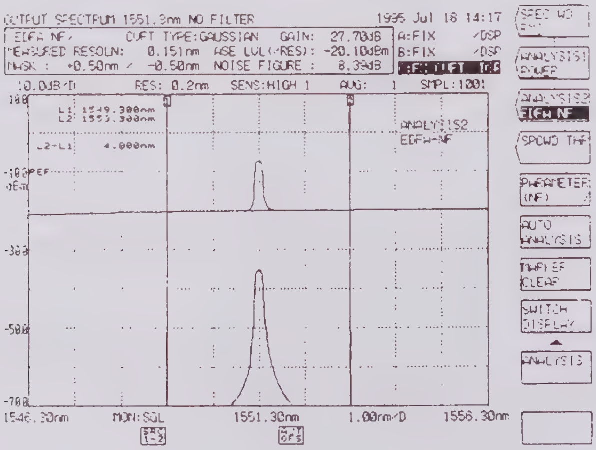
G = (PB – PASE) / PA

PA : Peak level of signal light
PB : Peal level of the light amplified by optical fiber AMP

3) NF

$$NF \frac{PASE}{\Delta v \cdot G \cdot h \cdot v} + \frac{1}{G}$$

Δv : Measuring bandwidth
Value obtained by finding the half-amplitude value of trace A waveform and then performing frequency conversion.
h : Plank's constant
v : Center grequency
Value obtained by finding the peak wavelength of trace B waveform and then performing frequency conversion


OUTPUT SPECTRUM 1551.3nm NO FILTER 1995 Jul 18 14:17
EDFA NF/ CURT TYPE:GAUSSIAN GAIN: 27.70dB
MEASURED RESOLN: 0.151nm ASE LVL(/RES): -20.10dBm
MASK : +0.50nm / -0.50nm NOISE FIGURE : 8.39dB
A:FIX /DSP
B:FIX /DSP
10.0dB/D RES: 0.2nm SENS:HIGH 1 AVG: 1 SMPL:1001
L1 1549.300nm
L2 1553.300nm
L2-L1 4.000nm

NF Measurement Waveform

5.3.2 Curve fit function

1. Outline

   For all the data that exceeds the spectrum limit value (set by <CURVE FIT C> or <CURVE FIT PK C>. this function performs frequency conversion of wavelength and LOG conversion of level and then performs approximation to a quadratic curve by the method of least squares.

   The peak curve fit function performs frequency conversion of wavelength and LOG conversion of level for the mode peaks exceeding the limit value, and then performs approximation to a quadratic curve by the method of least squares.

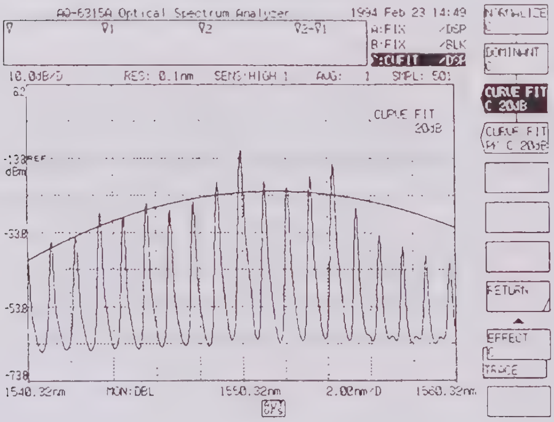
   (The quadratic curve of LOG data corresponds to a normal distribution curve in linear value.)

   If the number of data is insufficient, curve fit processing is impossible. In this case, the original spectrum is displayed as it is.

2. Operations

   1) Press the [TRACE] switch and the <ACTIVE TRACE A B C> key and set the active trace to "C".

   2) By pressing the <EFFECT> and <CURVE FIT C> keys, curve fit processing is performed.
      Regarding the limit value, the set value displayed in the interrupt display section by the rotary knob, step keys or ten-key pad when the key is pressed.
      When the <EFFECT> and <CURVE FIT PK C> keys are pressed, peak curve fit processing is performed. The limit value can be changed in the same way.



AQ-6315A Optical Spectrum Analyzer 1994 Feb 23 14:49

A:FIX /DSP
B:FIX /BLK
C:CUFIT /DSP

10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501

1540.32nm MON:DBL 1550.32nm 2.00nm/D 1560.32nm

Curve Fit Display Waveform

5.3.3 WDM analysis function

Using the WDM waveforms, set the threshold (THRESH*.*dB(TH)), the maximum number of channels (MAX NUM**), and the difference between the top and bottom waveforms (MODE DIFF**.*dB), and determine the following values. The results are displayed on a list.

Peak wavelength (WAVELENGTH), λi, for each channel
Peak level (LEVEL), Li, for each channel
Noise level (NOISE), LNi, of each channel peak
Difference between signal level and noise level (SNR), SNi, of each channel peak
Wavelength difference from the reference channel peak
Level difference from the reference channel peak
where, "i" is 1, 2, ..., n.

① Search for channels and determine the channel peak of the channel whose top and bottom level difference is greater than the set value.

② Select only the channel peak values whose level difference is within the threshold (TH).

③ Select the channel peaks having the large level (up to the maximum number of channels specified), and assign them the sequential numbers (from the short wavelength side to 1 to n). Also, determine the pe wavelength (λi) and peak level (Li) for each channel.

④ Determine the noise level (LNi) of each channel peak.

- Determine level "Ei" at an intermediate point of each channel.
- Determine the average of the right and left "Ei" of each channel. (Linear interpolation)
- Divide the result by the resolution of the Analyzer (stored in memory) to convert it into the power density in 1 nm, and set it as the noise level (LNi).

* Calculate the "LN1" and "LNn" of WDM channel peak at both ends as follows:

- For the leftmost-end (i=1) channel peak, determine the average between the level at an intermediate point from the second (i=2) channel peak and the level at a point shifted (for the amount of wavelength) from the leftmost-end channel peak to the short wavelength side. Similarly, determine the LN1.
- For the rightmost-end (i=n) channel peak, determine the average between the level at an intermediate point from the "i-th" (n-1) channel peak and the level at a point shifted (for the amount of wavelength) from the rightmost-end channel peak to the long wavelength side. Similarly, determine the "LNn".

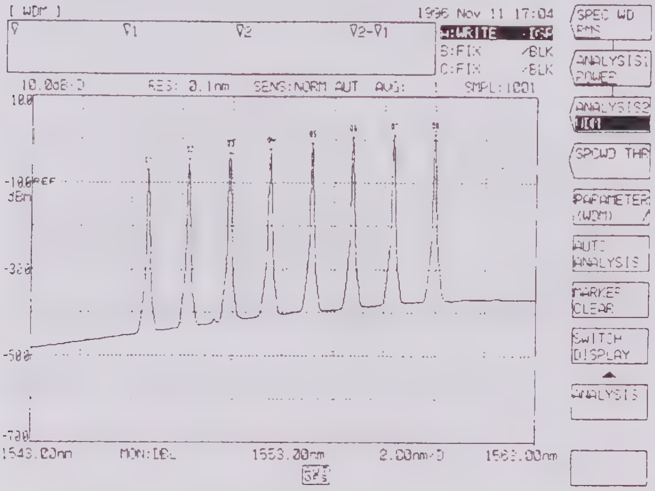
⑤ - When selecting the <OFFSET>:

  Determine the wavelength difference (OFFSET WL) and the level difference (OFST LVL) for any reference channel.

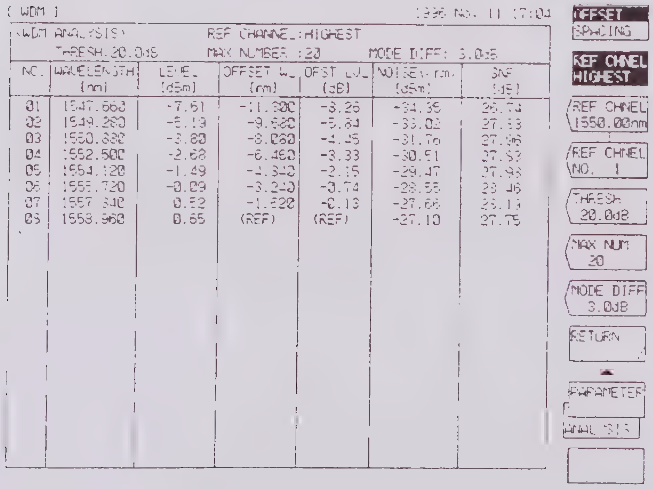
- When selecting the <SPACING>:

  Determine the wavelength difference (SPACING) and the level difference (LVL DIFF) for the channel of the next short wavelength side.

* If the marker has been set to the frequency display mode, the wavelength and the wavelength difference of each channel peak are displayed in frequency.



WDM measurement waveform



[WDM] 1996 Nov 11 17:04

<WDM ANALYSIS> REF CHANNEL:HIGHEST

THRESH.20.0dB MAX NUMBER :20 MODE DIFF: 3.0dB

NO.	WAVELENGTH (nm)	LEVEL (dBm)	OFFSET WL (nm)	OFST LVL (dB)	NOISE(/nm) (dBm)	SNR (dB)
01	1547.660	-7.61	-11.300	-8.26	-34.35	26.74
02	1549.280	-5.19	-9.680	-5.84	-33.02	27.83
03	1550.880	-3.80	-8.080	-4.45	-31.76	27.96
04	1552.500	-2.68	-6.460	-3.33	-30.51	27.83
05	1554.120	-1.49	-4.840	-2.15	-29.47	27.98
06	1555.720	-0.09	-3.240	-0.74	-28.55	28.46
07	1557.340	0.52	-1.620	-0.13	-27.66	28.18
08	1558.960	0.65	(REF)	(REF)	-27.10	27.75

WDM list

5.4 Spectrum Width Data Calculation Algorithm

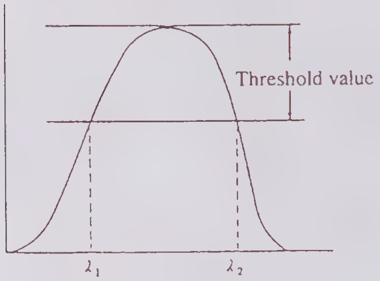
In this equipment, the spectrum width of a displayed waveform can be calculated by the [ANALYSIS] switch. The following explains the three spectrum width calculation methods and the notch width measurement algorithm.

5.4.1 Envelope method

1) Make a mode search to obtain mode peaks.
After the mode is judged by the peak/bottom difference (set by [PEAK SEARCH] <MODE DIFF>), the values exceeding the limit value TH2 (set by <ENV TH2> are found.

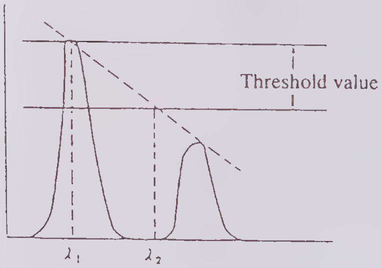
2) Obtain the spectrum width.
The method of obtaining it as follows.

(a) For one mode peak or less



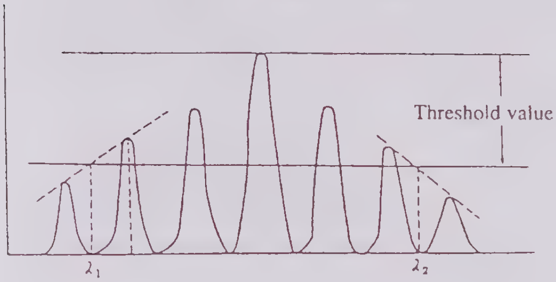
The wavelengths where the spectrum and threshold value TH1 (set by <ENV TH1> intersect are specified as λ_1 and λ_2 and $\lambda_2 - \lambda_1$ is regarded as spectrum width $\Delta\lambda$.

(b) For two mode peaks



The difference ($\lambda_2 - \lambda_1$) between wavelength λ_2 and peak wavelength λ_1 where the straight line (envelope) connecting individual peaks intersects with the threshold value TH1 is regarded as spectrum width $\Delta\lambda$.
However, when the envelope does not intersect with TH1, the wavelength of 2 mode peak is specified as λ_1 or λ_2.

c) For three or more mode peaks



(i) Connect individual mode peaks by straight line (envelope).

(ii) When the wavelengths where the envelope intersects with the threshold value TH1 are specified as λ_1 and λ_2 and $\lambda_2 - \lambda_1$i is regarded as spectrum width $\Delta\lambda$.

However, when the envelope does not intersect with TH1, the lowest-level mode peak is specified as λ_1 or λ_2.

3) Multiply the obtained spectrum width $\Delta\lambda$ by the magnification K (set by <ENV K>).

4) λc displayed in the data area represent the center of the spectrum width ($\Delta\lambda$).

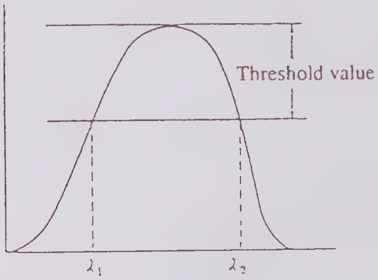
5) The mode peak count above TH2 is shown in the MODE data area.

5.4.2 Threshold method

1) Make a mode search to find mode peaks. The modes exceeding the peak/bottom difference (set by <MODE DIFF> of [PEAK SEARCH]) are searched.

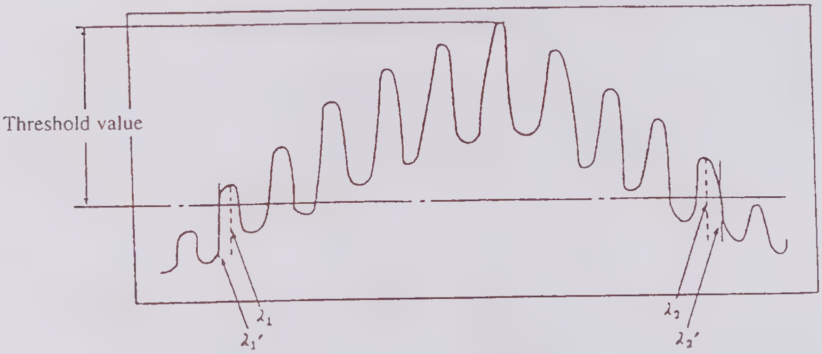
2) Find the spectrum width.

(a) For one mode peak or less



The wavelengths where the spectrum intersects and the threshold value (set by <THRESH TH>) intersect are specified as λ_1 and λ_2 and $\lambda_2 - \lambda_1$i is regarded as spectrum width $\Delta\lambda$.

(b) For two or more mode peaks



(i) The most outer mode peak wavelengths exceeding the threshold value TH among mode peaks are specified as λ_1 and λ_2.

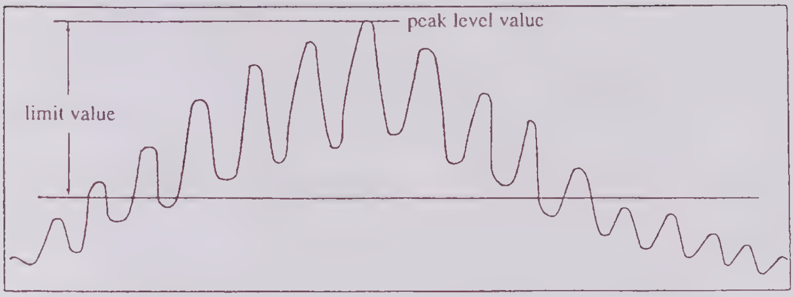
(ii) When the <MODE FIT> key is ON (display in reverse video), $\lambda_2 - \lambda_1$ is the spectrum width. When the <MODE FIT> key is OFF (display in non-reverse video), find the wavelengths λ_1' and λ_2' being outside λ_1 and λ_2 where the spectrum and threshold value intersect. Accordingly, $\lambda_2' - \lambda_1'$ s the spectrum width.

3) Multiply the obtained spectrum width $\Delta\lambda$ by the magnification K (set by <THRESH K>.

4) λc displayed in the data area represents the center of the spectrum width ($\Delta\lambda$).

5) The mode peak count between $\lambda 1$ and $\lambda 2$ is shown in the MODE data area.

5.4.3 RMS (effective value) method



1) Take out the data points exceeding the limit value TH (set by <RMS TH>, as shown in the above figure, within the displayed waveform, and find the spectrum width by the following calculation.

2) When the RMS method is used, adopt all the points exceeding the limit value TH for calculation.
When the PK RMS method is used, the displayed waveforms are searched in Mode Search mode and only the mode peak values above TH are calculated.

3) When the wavelength at beach point is Λi and the level at the point is Pi, the mean wavelength λc can be found by the following expression.

$$\lambda c = \frac{\Sigma Pi \cdot \lambda i}{\Sigma Pi}$$

4) By using the mean wavelength λc obtained in 3), find the spectrum width $\Delta\lambda$ by the following expression.

$$\triangle\lambda = K \times \sqrt{\frac{\Sigma Pi \cdot (\lambda i - \lambda c^2)^2}{\Sigma Pi}}$$

K : Magnification by which the spectrum width is multiplied.
(Set ty <RMSK>.)

5) When the PK RMS method is used, the mode peak count above the TH is shown in the MODE data area.

5.4.4 Notch width measurement methods

By using the active trace waveforms, set the threshold (**.*dB), TH. Then, determine the notch width, Δλ, and its center wavelength, λc.

① Determine point "λmin" having the minimum level.

② Determine point "λ0" having the maximum level at the left to the "λmin".
Also, determine point "λ1" having the maximum level at the right to the "λmin".
Compare the "λ0" and "λ1" levels, and set the larger level as "L".

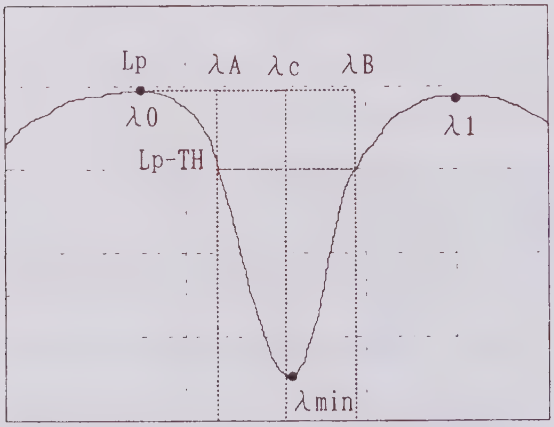
③ Set the leftmost wavelength as "λA" which crosses the "Lp-TH" level (log value) of spectrum between "λ0" and "λmin".
Set the rightmost wavelength as "λB" which crosses the "Lp-TH" level (log value) of spectrum between "λmin" and "λ1".

④ Calculate the center wavelength (λc) using the following expression:

$$\lambda c = \frac{\Sigma A + \lambda B}{2}$$

⑤ Calculate the notch width (Δλ) using the following expression:

$$\Delta\lambda = \lambda B - \lambda A$$



Notch width measurement

5.5 Video Output Specifications

On the rear panel of this equipment, there is a video output terminal from which the same video signals as LCD display are output.

Horizontal scanning frequency	:	31.469 kHz
Vertical scanning frequency	:	59.94 Hz
Connector	:	D-sub 15-pin connector

Table 5-4 Video Output Pin Connections (VGA compatible)

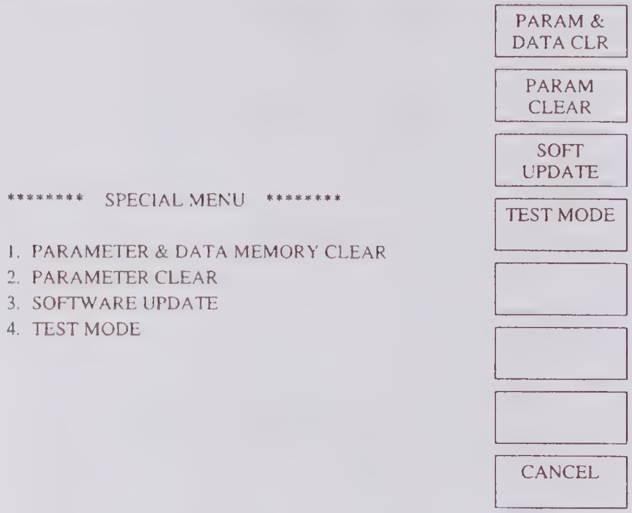
Pin No.	Signal name	Remarks
1	RED	Video signal (red)
2	GREEN	Video signal (green)
3	BLUE	Video signal (blue)
4	N.C	Unused
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	N.C	Unused
10	GND	Ground
11	GND	Ground
12	N.C	Unused
13	HSYNC	Horizontal synchronizing signal
14	VSYNC	Vertical synchronizing signal
15	N.C	Unused

5.6 Nonvolatile Data Initialize Function

This equipment stores wave data, measuring conditions, soft key select status (display status of keys displayed in reverse video or keys that is reversed by pressing), etc. in memory.
When the power supply is turned off after use, the above status is held.
Besides, 32 data memories for measured waveform storage and 20 programs are held in nonvolatile memory.
By the following operations, the above nonvolatile data can be initialized.
Also, Table 5-5 shows the type of nonvolatile data and the initial value of each data.

(1) Turn on the power supply pressing the [CENTER] switch.

(2) The BOOT function (data initialize, software update) is started and the following menu is displayed.



When turning on the power supply pressing [CENTER]

(3) Press the soft key 1 or 2 depending on the contents to be initialized.

(4) The contents of each key are as follows.

- <PARAM & DATA CLR> key
  All of parameters, waveform memory and programs are initialized and the equipment is started in the same status as where it was delivered.
  (The nonvolatile data shown in Table 5-5 is all initialized.)

- <PARAM CLEAR> key
  Only parameters are initialized and this equipment is started with the normal screen.
  The nonvolatile data is initialized excluding the functions marked with asterisks (*) shown in Table 5-5

- <CANCEL> key
  This equipment is started with the normal screen without doing anything.

  The <SOFT UPDATE> key is used for software version-up and the <4. TEST MODE> key is used for adjustment at plant. They must not be operated by the user.
  When the key is pressed, the equipment is started with the normal screen by pressing the <EXIT> key at <SOFT UPDATE>.
  At <TEST MODE>, the screen displayed by turning on the power supply pressing the [CENTER] switch is displayed again by pressing the <CANCEL> key.

5.7 Wavelength Calibrate Function

This equipment is provided a wavelength absolute value calibrate function using the reference light source including gas laser. For details, refer to 5.1.14 [SYSTEM] switch, <WL CAL>.

5.8 Setting Clock

This equipment is provided with a clock backed up by battery to display year-month-day and time in the upper right part of the screen. This clock is used as a time stamp for outputting date and time at printer/plotter output and recording data in floppy disk.
For how to set the clock, refer to 5.1.14 [SYSTEM] switch, <SET CLOCK>.

5.9 WARNING Display Function

When a fault due to a misoperation occurs or when the select status of other keys are forcibly changed after the select status of a soft key is changed, this equipment displays a WARNING message.
There are two types of message, namely, short message displayed with a number in the window appearing in the middle of the screen, and long message displayed by pressing the [HELP] switch. If the <WARNING> key is selected by the soft key <BUZZER> of the [SYSTEM] switch beforehand, the buzzer sounds to attract attention concurrently with a message display.
Table 5-6 shows warning numbers, short messages and causes of occurrence.

Table 5-5 Initial Value of Nonvolatile Data (1/6)

Item	Function	Initial state
[SWEEP]	<SEG POINT>	1
	<SWEEP MKR L1-L2>	OFF
	<SWP INTVL>	MINIMUM
[CENTER]	<CENTER>	1050.00 nm
	<START WL>	300.00 nm
	<STOP WL>	1800.00 nm
	<AUTO CENTER>	OFF
[SPAN]	<SPAN>	1500.0 nm
	<START WL>	300.00 nm
	<STOP WL>	1800.00 nm
	<0 nm SWEEP TIME>	0
[LEVEL]	<REF LEVEL>	−10 dBm
	<LOG SCALE>	ON, 5.0 dB/D
	<LIN SCALE>	OFF
	<BASE LVL>	0 mV
	<AUTO REF LEVEL>	OFF
	<dBm dBm/nm>	dBm
	<SUB LOG>	ON, 5.0 dB/D
	<SUB LIN>	OFF, 0.125/F
	<SUB SCALE>	OFF, 5.0 dB/km
	<SUB SCALE>	OFF, 10.0%/D
	<OFST LVL>	0.0 dB
	<OFST LVL>	0.0 dB/km
	<SCALE MIN>	0
	<SCALE MIN>	0%
	<LENGTH>	1.000 km
	<AUTO SUB SCALE>	OFF
[SETUP]	<RESOLN>	5.0 nm
	<SENS>	NORM RANG HOLD
	<AVERAGE TIME>	1
	<SAMPLING PT>	1001
	<CW LIGHT MEASURE>	ON
	<PLS LIGHT MEASURE>	OFF
	<LPF MODE>	OFF
	<PEAK HOLD>	ON, 10 ms
	<EXT TRG MODE>	OFF
	<MONOCHRO SGL DBL>	SGL
	<CHOP INT EXT>	INT
[MARKER]	<SET MARKER 1>	None
	<SET MARKER 2>	None
	<MKR UNIT nm THz>	nm
	<LINE MARKER 1>	None
	<LINE MARKER 2>	None
	<LINE MARKER 3>	None
	<LINE MARKER 4>	None
	<SEARCH L1-L2>	OFF

Table 5-5 Initial Value of Nonvolatile Data (2/6)

Item	Function	Initial state
[PEAK SEARCH]	<PEAK SEARCH>	ON
	<BOTTOM SEARCH>	OFF
	<SET MARKER 1>	None
	<SET MARKER 2>	None
	<AUTO SEARCH>	OFF
	<MODE DIEF>	3.00 dB
[ANALYSIS]	<SPEC WD ENVELOPE>	ON
	<ENV TH1>	3.0 dB
	<ENV TH2>	13.0 dB
	<ENV K>	1.00
	<SPEC WD THRESH>	OFF
	<THRESH TH>	3.0 dB
	<THRESH K>	1.00
	<MODE FIT>	OFF
	<SPEC WD RMS>	OFF
	<RMS TH>	20.0 dB
	<RMSK>	2.00
	<SPEC WD PEAK RMS>	OFF
	<PK RMS TH>	20.0 dB
	<PK RMS K>	2.00
	<NOTCH>	OFF
	<NOTCH TH>	3.0 dB
	<ANALYSIS1 SMSR>	OFF
	<SMSR MODE>	1
	<SMSR MASK>	±0.00 nm
	<ANALYSIS1 POWER>	OFF
	<PWR OFST>	0.00 dB
	<ANALYSIS1 FP-LD>	—
	SPEC WIDTH	"ALGO" = PK RMS "TH" = 20.0 dB "K" = 2.00 "MODE DIFF" = 3.00 dB
	MEAN WL	"ALGO" = PK RMS "TH" = 20.0 dB "K" = 2.00 "MODE DIFF" = 3.00 dB
	TOTAL POWER	"ALGO" = POWER "OFST LEVEL" = 0.00 dB
	MODE NO.	"ALGO" = PK RMS "TH" = 20.0 dB "K" = 2.00 "MODE DIFF" = 3.00 dB
	<ANALYSIS1 DFB-LD>	—
	-X dB WIDTH	"ALGO" = THRESH "TH" = 20.0 dB "K" = 1.00 "MODE FIT" = OFF "MODE DIFF" = 3.00 dB

Table 5-5 Initial Value of Nonvolatile Data (3/6)

Item	Function	Initial state
[ANALYSIS]	SMSR	"ALGO" =SMSR1 "MODE DIFF" = 3.00 dB "SMSR MASK" = ±0.00 nm
	<ANALYSIS1 LED>	—
	SPEC WIDTH	"ALGO" = THRESH "TH" = 3.0 dB "K" = 1.00 "MODE FIT" = OFF "MODE DIFF" = 3.00 dB
	MEAN WL	"ALGO" = RMS "TH" = 20.0 dB "K" = 2.00
	TOTAL POWER	"ALGO" = POWER "OFST LEVEL" = 0.00 dB
	<ANALYSIS2 EDFA NF>	—
	<OFST (IN)>	0.00 dB
	<OFST (OUT)>	0.00 dB
	<PLUS MSK>	1.00 nm
	<MINUS MSK>	1.00 nm
	<CVFT TYPE>	GAUSSIAN
	<CVFT THR>	3.0 dB
	<ANALYSIS2 WDM>	OFF
	<OFFSET SPACING>	OFFSET
	<REF CHNEL HIGHEST>	ON
	<REF CHNEL>	OFF, 350.00 nm
	<REF CHNEL NO.>	OFF, 1
	<THRESH>	20.0 dB
	<MAX NUM>	20
	<MODE DIFF>	3.0 dB
	<SPECWD THR>	
	<ENVELOPE>	3.0 dB
	<THRESH>	3.0 dB
	<RMS>	20.0 dB
	<PEAK RMS>	20.0 dB
	<AUTO ANALYSIS>	OFF
[TRACE]	<WRITE A>	ON
	<FIX A>	OFF
	<MAX HOLD A>	OFF
	<ROLL AVG A>	OFF, 5
	<DISPLAY A BLANK A>	DISPLAY A
	<ACTIVE TRACE ABC>	A
	<WRITE B>	OFF
	<FIX B>	ON
	<MIN HOLD B>	OFF
	<ROLL AVG B>	PFF, 5
	<DISPLAY B BLANK B>	BLANK B
	<WRITE C>	OFF
	<FIX C>	ON

Table 5-5 Initial Value of Nonvolatile Data (4/6)

Item	Function	Initial state
[TRACE]	<CALCULATE C>	OFF
	<A–B → C>	ON
	<B–A → C>	OFF
	<A–B (LIN) → C>	OFF
	<B–A (LIN) → C>	OFF
	<A+B (LIN) → C>	OFF
	<EFFECTC>	OFF
	<NORMALIZE C>	ON
	<DOMINANT C>	OFF
	<CURVE FIT C>	OFF
	<CURVE FIT PK C>	OFF
	<DISPLAY C BLANK C>	BLANK C
	*TRACE A, B, C (Waveform display)	None
[DISPLAY]	<NORMAL DISPLAY>	ON
	<SPLIT DISPLAY>	OFF
	<TRACE A UP LOW>	UP
	<TRACE B UP LOW>	UP
	<TRACE C UP LOW>	LOW
	<UPPER HOLD>	OFF
	<LOWER HOLD>	OFF
	<3D DISPLAY>	OFF
	<ANGLE>	–50 deg
	<Z-SCALE>	16
	<MEMORY 1st 2nd>	1st
	<NOISE MSK>	OFF
[MEMORY]	<SAVE>	–
	<SAVE A → MEM>	ON
	<SAVE B → MEM>	OFF
	<SAVE C → MEM>	OFF
	<LBL LIST CONDTN>	LBL
	<RECALL>	–
	<RECALL MEM → A>	ON
	<RECALL MEM → B>	OFF
	<RECALL MEM → C>	OFF
	<LBL LIST CONDTN>	LBL
	<MEMORY LIST>	–
	<LBL LIST CONDTN>	LBL
	*MEMORY NO. 0 to 31	None

Table 5-5 Initial Value of Nonvolatile Data (5/6)

Item	Function	Initial state
[FLOPPY]	<WRITE>	—
	<TRACE RD/WRT>	ON
	<ABC → FD>	ON, A
	<MEMORY → FD>	OFF
	<3D → FD 1st 2nd>	OFF (, 1st)
	<BIN TXT BIN + ASC>	BIN
	<DATA RD/WRT>	OFF
	<DATA & TIME>	ON
	<LABEL>	ON
	<DATA AREA>	ON
	<CONDITION>	ON
	<ADD WRITE OVERWRITE>	ADD WRITE
	<READ>	
	<TRACE RD/WRT>	ON
	<FD → ABC>	ON, A
	<FD → MEMORY>	OFF
	<FC → 3D 1st 2nd>	OFF (,1st)
[PROGRAM]	<PROGRAM EDIT>	—
	<EDIT>	—
	<PROGRAM LINE>	ON
	<COMMAND SELECT>	OFF
	<PARAMETER EDIT>	OFF
	<EXEC1 (**)>	01
	<EXEC2 (**)>	02
	<EXEC3 (**)>	03
	<EXEC4 (**)>	04
	<EXEC5 (**)>	05
	<EXEC6 (**)>	06
	*PROGRAM NO.1 to 20	None
[SYSTEM]	<COPY KEY PTR PLTR>	PTR
	<COPY CONFIG>	—
	<PLOT TRACE>	ON
	<PLOT SCALE>	ON
	<PLOT GRID>	ON
	<PLOT CONDITION>	ON
	<PLOT MARKER>	ON
	<PLOT OTHERS>	ON
	<PRINTER SAVE SPC>	ON
	<PLOTTER ADRS>	5
	<PEN SEL>	AUTO
	<PLOTTER AUTO FEED>	OFF
	<SET CLOCK>	—
	<YR-MO-DY>	ON
	<MO-DY-YR>	OFF
	<DY-MO-YR>	OFF

Table 5-5 Initial Value of Nonvolatile Data (6/6)

Item	Function	Initial state
[SYSTEM]	<SET COLOR>	–
	<DEFAULT COLOR>	ON, 1
	<MANUAL COLOR>	OFF
	<CHAR1 CHAR2>	ON, CHAR1
	<SOFTKEY1 SOFTKEY2>	OFF (, SOFTKEY1)
	<WINDOW>	OFF
	<MARKER SETTING>	OFF
	<SCALE BASE>	OFF
	<TRACE A B C>	OFF (,A)
	<SELECT R G B>	R
	<MY ADRS>	1
	<MEAS WL AIR VAC>	AIR
	<WL CAL>	632.816 nm
	<WL SHIFT>	0.00 nm
	<LEVEL SHIFT>	0.00 dB
	<AUTO OFFSET>	ON
	<BUZZER>	–
	<CLICK>	ON
	<WARNING>	ON
[ADVANCE]	<POWER METER>	–
	<AREA>	FULL
	<RELATIVE>	OFF
	<dBm W>	dBm
	<OPTICAL OUTPUT>	–
	<OUTPUT WL>	1050.000 nm
	<OUTPUT BW>	0.10 nm
	<BM ALIGN>	0

When the <PARAM CLEAR> key of the SPECIAL MENU is pressed, the functions marked with asterisk (*) are not initialized.

(When the <PARAM & DATA CLR> key is pressed, however, all functions are initialized.)

Table 5-6 WARNING message List (1/3)

No.	Message	Cause of occurrence
1	Unsuitable Resolution	Because resolution setting is improper for the span and the number of samples, there is a possibility that data may not be collected perfectly.
2	Unsuitable Level Scale	In the range fixed mode (SENS: NORMAL RANGE HOLD) or pulse light measuring mode, the level scale was set over 5 dB/D. In the range fixed mode and pulse light measuring mode, if the level scale is set over 5 dB/D, the data in the upper and lower parts of the screen cannot be displayed correctly.
3	Unsuitable Ref Level	In setting the waveform peak level to the reference level, it was set to the nearest value in the reference level setting range because the peak level value was out of the reference level setting range.
4	Unsuitable Maker value	In setting the marker value to the mean wavelength or reference level, it was set to the nearest value in the setting range because the marker value was out of the setting range.
5	<AUTO ANALYSIS> off	The selected status of <AUTO ANALYSIS> was cleared.
6	<AUTO PEAK SRCH> off	The selected status of <AUTO PEAK SEARCH> was cleared.
7	Trace A&B resoln mismatch	The trace A resolution is different from the trace B resolution in setting.
8	<HOLD> off	Because trace assignment for split screen was changed, HOLD was cleared.
9	Trace * state changed	Because the trace in HOLD status was changed from FIX to another, HOLD was cleared.
100	Auto sweeping now	During the AUTO sweep execution, an invalid key was pressed.
101	All traces is in FIXed state	Because all of trace A, B and C are set to FIX, waveform rewrite processing is impossible.
102	Sweep stopped	Because all of trace A, B and C are set to FIX during a sweep, the sweep was stopped.
103	No data in active trace	When there was no data in active trace the setting of moving marker, peak search or the analysis function was executed.
104	Trace A & B mismatch	Because there is a difference in condition setting between trace A and B, subtraction display is impossible.
106	Unsuitable recall condition	At 3-dimensional display, because there is a difference in mean wavelength, span or waveform type in the memory, it cannot redisplayed.

Table 5-6 WARNING message List (2/3)

No.	Message	Cause of occurrence
107	`Unsuitable memory number`	In the memory SAVE or RECALL mode, a number other than 0 to 31 was specified. Or the memory saving no waveform was recalled.
108	`Marker setting out of range`	When both line marker 1 and 2 are set out of the measuring range, the marker-to-marker analysis was executed.
109	`Auto sweep failed`	After an AUTO sweep was started, it was stopped because the optimum conditions could not be found.
120	`Disk not inserted`	No floppy disk is inserted into the drive.
121	`Disk not initialized`	The floppy disk is not initialized. Or the format that cannot be used in this equipment is initialized.
122	`Disk is write protected`	The floppy disk is set to write inhibit.
123	`File not found`	The selected file could not be found, file read cannot be performed. Or no file on disk.
125	`Illegal file name`	The file name is illegal.
128	`File is write protected`	The file is in the read-only attribute and data cannot be rewritten or deleted.
129	`Disk full`	The disk capacity is insufficient to create a file.
130	`Directory full`	The directory area is full and a file cannot be created.
131	`No data`	No data to save exist.
132	`File is not a trace file`	The file is not a trace file and data cannot be read out.
133	`File is not a program file`	The file is not a program file and data cannot be read out.
134	`File is not a data file`	The file is not a data file and data cannot be read out.
135	`File is not a setting file`	The file is not a setting file and data cannot be read out.
140	`No paste possible`	In editing a program, empty lines are insufficient, so that paste processing cannot be executed.

Table 5-6 WARNING message List (3/3)

No.	Message	Cause of occurrence
141	`No merge possible`	In editing a program, because the merge result exceeds the maximum number of lines and merge processing cannot be executed.
142	`WL calibration failed`	In calibrating waveforms, the light source level is insufficient. Or the wavelength deviation exceeds the calibration range, calibrate processing cannot be executed.
160	`Printer paper empty`	Printer record paper is used up.
161	`Printer head up`	Because the printer head-up lever is UP, printing is impossible.
162	`Unsuitable output mode`	When plot processing was executed by the X-Y plotter, no output item on the screen was selected.
163	`GP-1B error`	The plotter address is incorrect. Or an GP-IB error occurred.
164	`Plotter error`	An error occurred on the X-Y plotter side.
165	`Unsuitable plot mode`	The displayed screen cannot be output to the plotter
200	`Fan motor stopped!`	The fan motor stopped.
201	`Monochromater error!`	The grating operation in the monochromater is abnormal.
202	`Monochromater error!`	An error occurred in a place other than the grating in the monochromater.
203	`Auto offset error!`	The AUTO OFFSET operation of the AMP is abnormal.
204	`Measure sequence error!`	In the sweep status, because the measurement sequence went out of order, the sweep stopped.

1) Numbers are classified according to below 100, 100 to 199, 200 to 299 and 300 to 399 as follows.
   1 to 99 .... After the function is executed, a message is output.
   100 to 99 .... The reason when the function cannot be executed is output.
   200 to 299 .... The message warns a hardware fault.
   300 to 399 .... Error upon execution of a program function (Refer to Chapter 6 Program Functions.)
2) The above numbers can be read as talk data for the GP-IB talker command "WARN?".
3) Warning priority: Among the above warnings, 200 to 299 (hardware errors) have top priority.
   If these occur concurrently with another cause, their processing is executed with priorirty.

Chapter 6 PROGRAM FUNCTION

This chapter described program functions.

Contents of Chapter 6

6.1 Outline 6-2

6.2 Program Input 6-3

6.2.1 Program name input and change 6-4

6.2.2 Program input and change 6-5

6.2.3 Registered command parameter section change 6-9

6.2.4 Line insertion and deletion and program list print 6-9

6.3 Program Copy 6-11

6.4 Program Deletion 6-12

6.5 Program Execution 6-13

6.5.1 Executable program selection 6-13

6.5.2 Program execution 6-14

6.5.3 Program pause 6-15

6.5.4 Program execute error 6-15

6.6 Description of Commands 6-18

6.6.1 Description of variables 6-18

6.6.2 Rule of four operations by variables 6-20

6.6.3 Specifications of "@=VAL (A$)" command 6-20

6.7 Program Examples 6-46

6.1 Outline

The program function means that measuring conditions, measuring procedures and other data are registered and executed. There are 200 steps per program and 20 programs can be created.

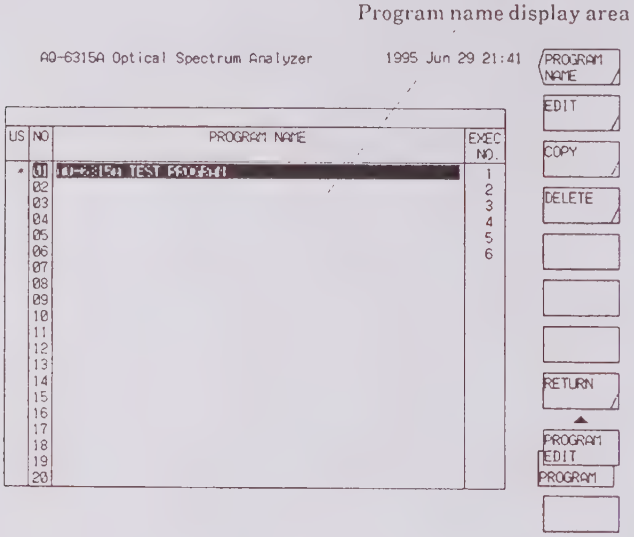
Created programs are stored in nonvolatile memory and also can be stored in the built-in floppy disk.

By using this function, automatic measurement can be performed without any external computer.

This function permits control the external unit connected to the connector [GP-IB 2], so that it can be used for various applications.

6.2 Program Input

When the <PROGRAM EDIT> key is pressed, the screen shown in Fig. 6-1 is displayed.



```
AQ-6315A Optical Spectrum Analyzer          1995 Jun 29 21:41

US | NO |            PROGRAM NAME                    | EXEC
   |    |                                            |  NO.
 * | 01 | AQ-6315A TEST PROGRAM                      |  1
   | 02 |                                            |  2
   | 03 |                                            |  3
   | 04 |                                            |  4
   | 05 |                                            |  5
   | 06 |                                            |  6
   | 07 |                                            |
   | 08 |                                            |
   | 09 |                                            |
   | 10 |                                            |
   | 11 |                                            |
   | 12 |                                            |
   | 13 |                                            |
   | 14 |                                            |
   | 15 |                                            |
   | 16 |                                            |
   | 17 |                                            |
   | 18 |                                            |
   | 19 |                                            |
   | 20 |                                            |
```

Fig. 6-1 Screen Displayed by Pressing <PROGRAM EDIT> key

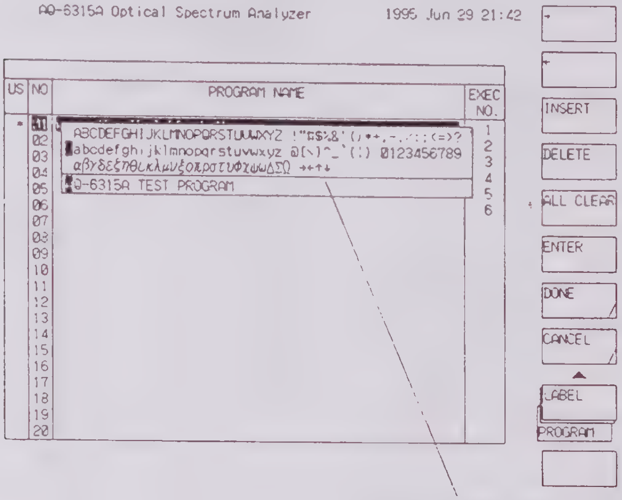
In the No. column, program Nos. 01 to 20 are displayed.

In the US column, "*" is displayed when the corresponding program No. is already registered.

In the program name display area, program names are displayed.

6.2.1 Program name input and change

To a program, a comment of up to 50 characters can be attached as its program name.
On the screen shown in Fig. 6-1, enter a program name and select a program name to be changed by moving the display in reverse video in the No. column up and down by using the rotary knob or step keys.
After number selection, press the <PROGRAM NAME> key. Then, the window character selection and program name input area appear as shown in the following figure, and the same contents as the program name display area are displayed in the program name input area.


AQ-6315A Optical Spectrum Analyzer
1995 Jun 29 21:42
US
NO
PROGRAM NAME
EXEC NO.
ABCDEFGHIJKLMNOPQRSTUVWXYZ !"#$%&'()*+,-./:;<=>?
abcdefghijklmnopqrstuvwxyz @[\]^_`{|} 0123456789
αβγδεξηθικλμνξοπρστυφχψωΔΣΩ →←↑↓
Q-6315A TEST PROGRAM
INSERT
DELETE
ALL CLEAR
ENTER
DONE
CANCEL
LABEL
PROGRAM
Program name input area

Program Name Input Screen

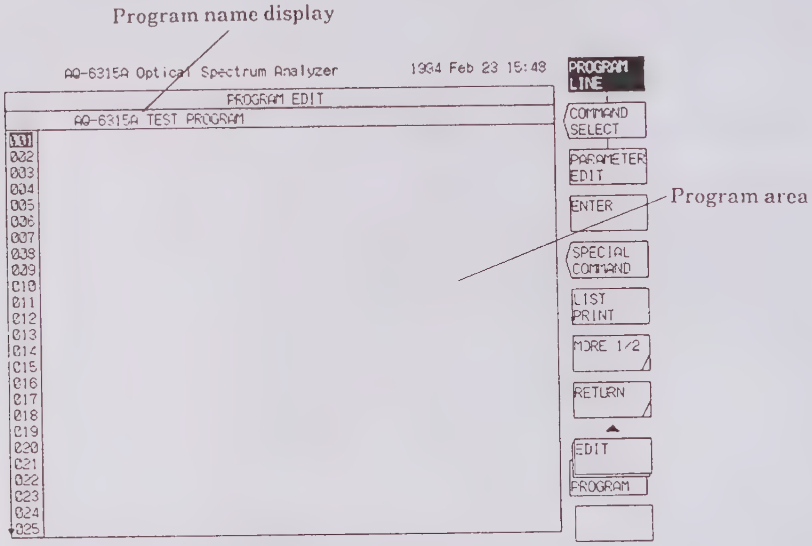
In the same way as label input, enter and change the program name in the program name input area. After that, when the <DONE> key is pressed, the program name is registered and the window disappears.

NOTE

1) *Program names can be entered even before program registration.*
2) *Before executing a program registered by GP-IB, specify its program No., and it is executed.*
3) *When a program name is entered in the programs which have been registered in <EXEC1(**)> to <EXEC6(**)> keys (the software keys which are displayed when the [PROGRAM] switch is pressed), the program name (up to 9 characters) is also displayed on these software keys. However, if the registered program has no list (that is, if an asterisk (*) is not shown in the US area), the program name is not displayed even when it is entered.*

6.2.2 Program input and change

On the screen shown in Fig. 6-1, move the display in reverse video in the No. column to the program No. to be entered or changed, and then press the <EDIT> key. Then, the program input screen shown in Fig. 6-2 is displayed.


Program name display

Program area

Fig. 6-2 Program Input Screen

- In the program area, the contents of the registered program are displayed together with line numbers. When the <PROGRAM LINE> key is selected, a display in reverse video appears in a line number in the program area. Select a line number for input or change by the rotary knob, step keys or ten key pad and edit the contents to be registered into the program area.

- At the right of the screen, when the <COMMAND SELECT> key is selected, a command list is displayed. When the <SPECIAL COMMAND> key is pressed, a special command list is displayed.

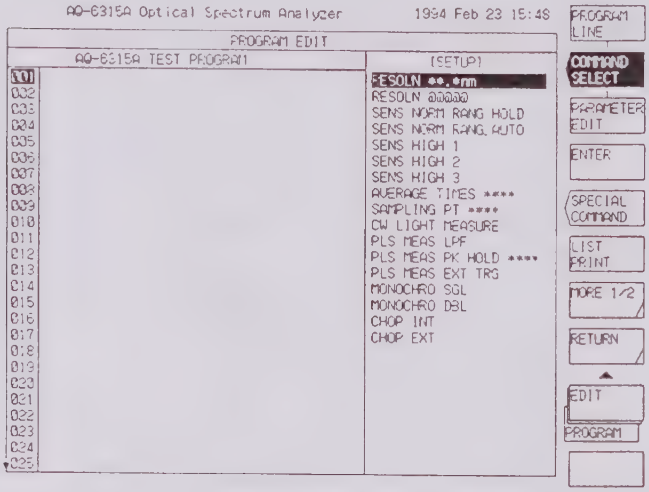
- By pressing the <RETURN> key, the screen shown in Fig. 6-1 is displayed again.

The commands to be registered in the program area are classified into ones that execute the same functions as panel switches (including soft keys), and other special commands.
The special commands are program control commands such as jump command and condition decide command, external unit control commands, and printer character output commands.
In the following, the command input procedure for each command is described.

(1) Registering the panel switch function

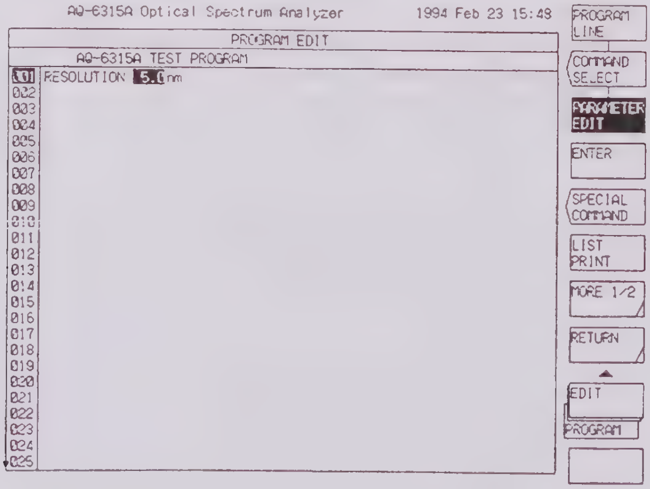
1) On the program input screen, move the display in reverse video in the program area to a line number to be input or changed.

2) When a panel switch is pressed, the command list corresponding to the switch at the right of the screen and one of commands is displayed in reverse video.
At this time, if the <COMMAND SELECT> key is selected beforehand, select a command to be registered by the rotary knob or step keys and press the <ENTER> key.
Then, the selected command is displayed in the program area.



```
AQ-6315A Optical Spectrum Analyzer          1994 Feb 23 15:48
                    PROGRAM EDIT
      AQ-6315A TEST PROGRAM                      [SETUP]
001                                   RESOLN **.*nm
002                                   RESOLN @@@@
003                                   SENS NORM RANG HOLD
004                                   SENS NORM RANG AUTO
005                                   SENS HIGH 1
006                                   SENS HIGH 2
007                                   SENS HIGH 3
008                                   AVERAGE TIMES ****
009                                   SAMPLING PT ****
010                                   CW LIGHT MEASURE
011                                   PLS MEAS LPF
012                                   PLS MEAS PK HOLD ****
013                                   PLS MEAS EXT TRG
014                                   MONOCHRO SGL
015                                   MONOCHRO DBL
016                                   CHOP INT
017                                   CHOP EXT
018
019
020
021
022
023
024
025
```

When the selected command is provided with a parameter, the current value or the initial value determined for each command is displayed and the parameter section is displayed in reverse video.



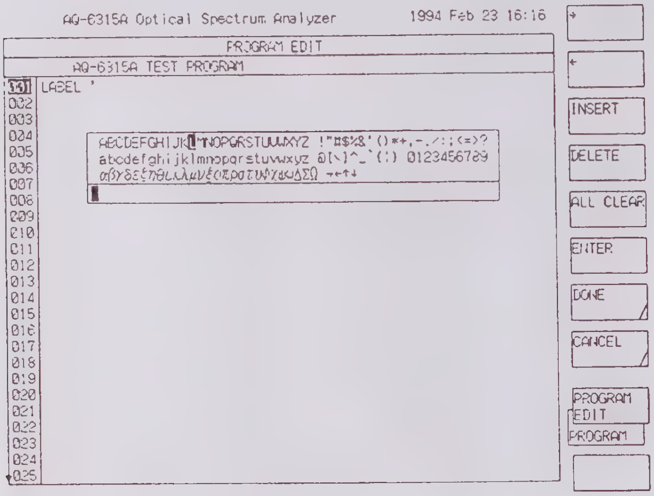
```
AQ-6315A Optical Spectrum Analyzer          1994 Feb 23 15:48
                    PROGRAM EDIT
      AQ-6315A TEST PROGRAM
001 RESOLUTION 5.0nm
002
003
004
005
006
007
008
009
010
011
012
013
014
015
016
017
018
019
020
021
022
023
024
025
```

3) When the command is provided with parameters and they must be changed, change them by the rotary knob, step keys or ten-key pad.

When the label command or floppy disk command requiring a character input is selected, the window for character selection and the label input area are displayed.

At that time, enter characters in the same way as label input.

By pressing the <DONE> key, the characters are entered in the parameter section.

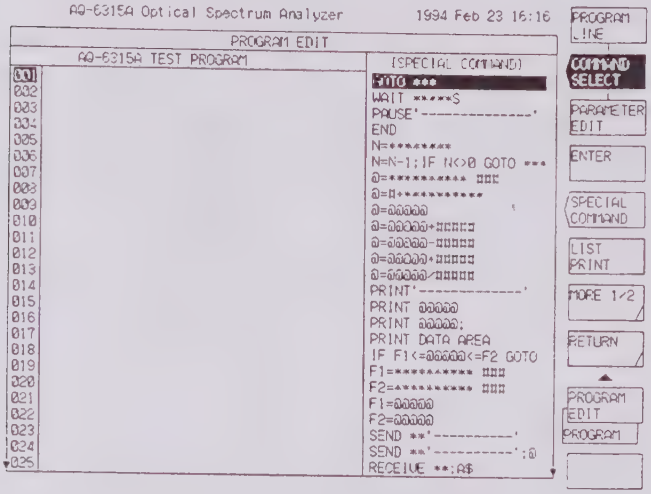


4) After registering the command in the program area (after registering parameters when they are provided), the line No. displayed in reverse video moves to the next line.

(2) Registering a special command

1) On the program input screen, move the display in reverse video in the program area to a line number to be input or changed.

2) When the <SPECIAL COMMAND> key is pressed, a special command list is displayed at the right of the screen and one of commands is displayed in reverse video.



```
[SPECIAL COMMAND]
GOTO ***
WAIT *****S
PAUSE'--------------'
END
N=********
N=N-1;IF N<>0 GOTO ***
@=********** □□□
@=□+**********
@=@@@@@
@=@@@@@+□□□□□
@=@@@@@-□□□□□
@=@@@@@*□□□□□
@=@@@@@/□□□□□
PRINT'-------------'
PRINT @@@@@
PRINT @@@@@;
PRINT DATA AREA
IF F1<=@@@@@<=F2 GOTO
F1=********** □□□
F2=********** □□□
F1=@@@@@
F2=@@@@@
SEND **'----------'
SEND **'----------';@
RECEIVE **;A$
```

Select a special command to be registered by the rotary knob or step keys and press the <ENTER> key. Then, the selected command is displayed in the program area.
When the command displayed in the program area is provided with parameters, the initial values determined for each command and the parameter section are displayed in reverse video.

3) When the command is provided with parameters and they must be changed, change the parameters by the rotary knob, step keys or ten-key pad and press the <ENTER> key.
When the print command requiring a character input is selected, the window for character selection is displayed. Enter characters in the same way as label input and press the <DONE> key. Then, the characters are entered in the parameter section.

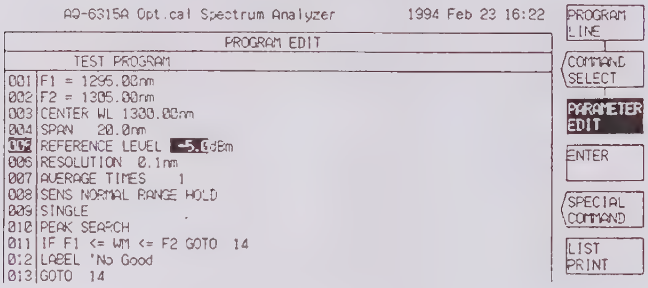
4) After registering the special command in the program area (after registering parameters when the program is provided with parameters), the line number displayed in reverse video moves to the next line.

6.2.3 Registered command parameter section change

To change only the parameter section of a command registered in the program area, observe the following procedure.

1) Press the <PROGRAM LINE> key and move the display in reverse video to a command line number to be changed by the rotary knob or step keys.

2) When the <PARAMETER> key is pressed, if the command is provided with parameters, the parameter section of the command displayed in the program area is displayed in reverse video and change processing is enabled. (When parameters are not provided, the <PROGRAM LINE> key is selected.)



```
AQ-6315A Optical Spectrum Analyzer          1994 Feb 23 16:22
                        PROGRAM EDIT
      TEST PROGRAM
001|F1 = 1295.00nm
002|F2 = 1305.00nm
003|CENTER WL 1300.00nm
004|SPAN   20.0nm
005|REFERENCE LEVEL -5.0dBm
006|RESOLUTION  0.1nm
007|AVERAGE TIMES    1
008|SENS NORMAL RANGE HOLD
009|SINGLE
010|PEAK SEARCH
011|IF F1 <= WM <= F2 GOTO  14
012|LABEL 'No Good
013|GOTO  14
```

3) Change the parameters in the same way as program input. After completion of the change, press the <ENTER> key. Then, the command whose parameters have been changed is registered in the program area.

6.2.4 Line insertion and deletion and program list print

To add or delete lines in the program area on the program input screen, press the <MODE 1/2> key to display the soft key menu of 2/2.

(1) Line insertion

Move the line number displayed in reverse video in the program area to the position where a line is to be inserted, by using the rotary knob or step keys, and press the <LINE INSERT> key.

Then, a blank line is inserted and the part subsequent to the line displayed in reverse video is shifted backward by one line. However, when 200 lines are already filled with registered programs or when the end line of the program reaches the line 200 during line insertion, no line can be inserted.

(2) Line deletion

Move the line number displayed in reverse video in the program area to a line to be deleted by the rotary knob or step keys and press the <AREA CUT> key. Then, the line displayed in reverse video is deleted and the subsequent program is shifted forward by one line.

If the <AREA CUT> key is pressed when the delete line range is set by the <AREA SELECT> key, all the set range is deleted and the subsequent program is shifted to the first line of the set range.

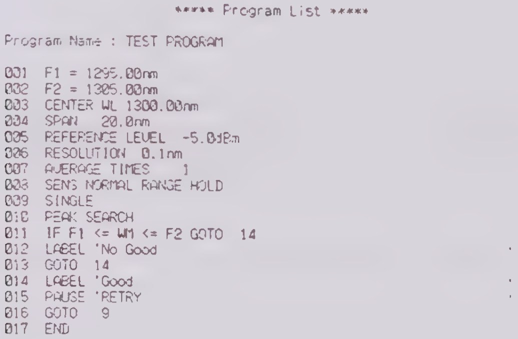
(3) Line copy

Move the line number displayed in reverse video in the program area to a line to be copied by the rotary knob or step keys and press the <AREA INSERT> key. Move it to a line to be inserted or overwritten and press the <PASTE INSERT> key or <PASTE OVR WRITE> key. Then, when the <PASTE INSERT> key is pressed, the contents to be copied are inserted and the program subsequent to the line displayed in reverse video is shifted backward by one line.

To set a line range and insert or overwrite its contents, set the desired copy range by the <AREA SELECT> key before pressing the <AREA COPY> key.

(4) Program list print

When the <LIST PRINT> key is pressed, the list containing the first line to the last line of the program in the edit process is output to the printer.



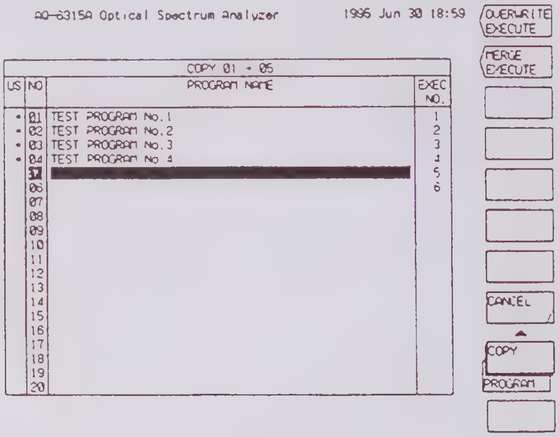
```
                    ***** Program List *****

Program Name : TEST PROGRAM

001  F1 = 1295.00nm
002  F2 = 1305.00nm
003  CENTER WL 1300.00nm
004  SPAN   20.0nm
005  REFERENCE LEVEL  -5.0dBm
006  RESOLUTION  0.1nm
007  AVERAGE TIMES    1
008  SENS NORMAL RANGE HOLD
009  SINGLE
010  PEAK SEARCH
011  IF F1 <= WM <= F2 GOTO  14
012  LABEL 'No Good
013  GOTO  14
014  LABEL 'Good
015  PAUSE 'RETRY
016  GOTO   9
017  END
```

Example of Program List

6.3 Program Copy

To copy the contents of the program with a certain number to another number, observe the following procedure.

(1) On the screen displayed by pressing the <PROGRAM EDIT> key of the [PROGRAM] switch, move the display in reverse video in the No. column by the rotary knob, step keys or ten key pad, select the program number of copy source, and press the <COPY> key.
The selected number is displayed in the ○○ section displaying "COPY ○○ → ××" in the upper part of the screen.
The screen changes as follows.



AQ-6315A Optical Spectrum Analyzer 1996 Jun 30 18:59

COPY 01 → 05

US	NO	PROGRAM NAME	EXEC NO.
•	01	TEST PROGRAM No.1	1
•	02	TEST PROGRAM No.2	2
•	03	TEST PROGRAM No.3	3
•	04	TEST PROGRAM No.4	4
	05		5
	06		6
	07		
	08		
	09		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		

(2) In the same way as (1), select the program number of copy destination and press the <OVER WRITE EXECUTE> key or <MERGE EXECUTE> key. Then, copy processing is executed.
The selected number is displayed in the xx section displaying "COPY○○ → ××" in the upper part of the screen.
The program name and the contents of program are copied from the number selected in (1) to the number selected in (2).

(3) When any program is already registered in the number of copy destination, execute the following method.

a) For overwriting
Press the <OVER WRITE EXECUTE> key.
The program name and the contents of program are overwritten from the number selected in (1) to the number selected in (2).

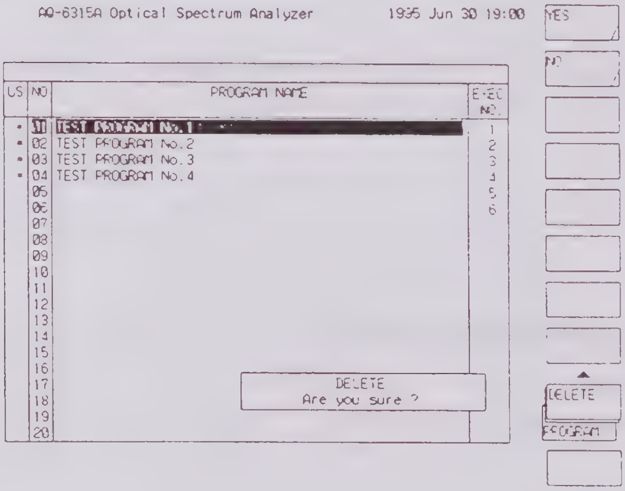
b) For adding behind a registered program
Press the <MERGE EXECUTE> key.
The contents of program of the number selected in (1) are added behind the number selected in (2).

6.4 Program Deletion

The procedure for deleting a registered program is shown below.

(1) On the screen displayed by pressing the <PROGRAM EDIT> key of the [PROGRAM] switch, move the display in reverse video in the No. column to a program number to be deleted by the rotary knob, step keys or ten key pad.

(2) When the <DELETE> key is pressed, the soft key menu for verification and a message are displayed. Next, by pressing the <YES> key, the program of the selected number and the program name are deleted.



AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 19:00

US	NO	PROGRAM NAME	EXEC NO.
*	01	TEST PROGRAM No.1	1
*	02	TEST PROGRAM No.2	2
*	03	TEST PROGRAM No.3	3
*	04	TEST PROGRAM No.4	4
	05		5
	06		6
	07		
	08		
	09		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		

DELETE
Are you sure ?

6.5 Program Execution

To execute a registered program, select the program and press the <EXECUTE> key on the screen displayed by pressing the <PROGRAM EXECUTE> key.

In the soft key menu displayed by pressing the [PROGRAM] switch, press any of the <EXEC1 (**) > to <EXEC6 (**)> keys.

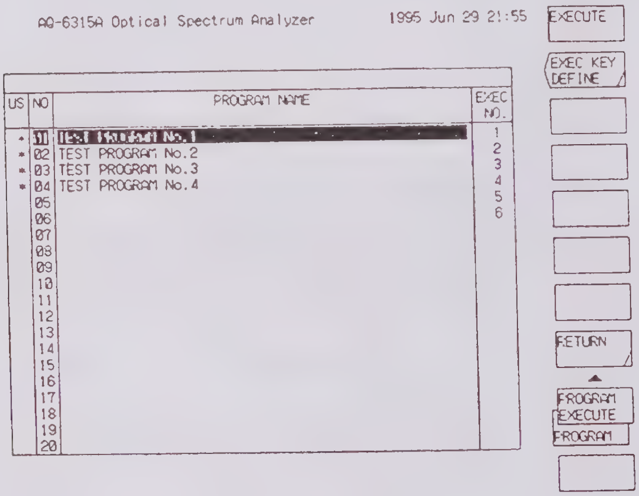
In this case, the program must be registered in the <EXEC1 (**)> to <EXEC6 (**)> keys beforehand.

(**: Program No.)

6.5.1 Executable program selection

(1) For executing a program by the <EXECUTE> key:

On the screen displayed by pressing the <PROGRAM EXECUTE> key, move the display in reverse video in the No. column to a program to be executed by the rotary knob, step keys or ten key pad.



AQ-6315A Optical Spectrum Analyzer 1995 Jun 29 21:55

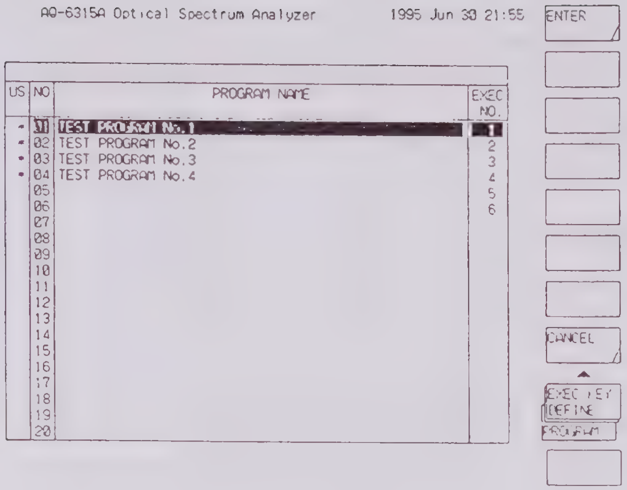
US	NO	PROGRAM NAME	EXEC NO.
*	01	TEST PROGRAM No.1	1
*	02	TEST PROGRAM No.2	2
*	03	TEST PROGRAM No.3	3
*	04	TEST PROGRAM No.4	4
	05		5
	06		6
	07		
	08		
	09		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		

Fig. 6-3 Screen Displayed by Pressing <PROGRAM EXECUTE> key

(2) For executing a program by the <EXEC1 (**)> to<EXEC6 (**)> keys

1) To register a program to the <EXEC1 (**)> to <EXEC6 (**)> keys, move the display in reverse video in the No. column to the program to be registered in the same way as (1) and press the <EXEC KEY DEFINE> key

The display in reverse video moves as shown in Fig. 6-4.



AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 21:55

US	NO	PROGRAM NAME	EXEC NO.
*	01	TEST PROGRAM No.1	1
*	02	TEST PROGRAM No.2	2
*	03	TEST PROGRAM No.3	3
*	04	TEST PROGRAM No.4	4
	05		5
	06		6
	07		
	08		
	09		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		

Fig. 6-4 Screen Displayed by Pressing <EXEC KEY DEFINE> key

2) Select a soft key number (<EXEC1 (**)> to <EXEC6 (**)>) of registration destination by the rotary knob, step key or ten key pad and press the <ENTER> key.
With this operation, the program selected in 1) is registered into the soft key number selected in 2).
The program name (up to 9 characters) is also displayed on the registered software key.
If any program is already registered in the number of registration destination, the program number is changed.

6.5.2 Program execution

When the <EXECUTE> key is pressed, the program displayed in reverse video in the No. column on the screen displayed by the <PROGRAM EXECUTE> key is executed.
When one of the <EXEC1 (**)> to <EXEC6 (**)> keys is pressed, the program registered in the corresponding key is executed.
The program is executed in sequence starting from line 001 and terminated by the "END" command or a blank line.
To stop program execution, press the auxiliary key <PROGRAM EXIT**> key.
Then, the program stops. (**: Program No. in execution)

6.5.3 Program pause

If the "PAUSE" command is used during program execution, this execution pauses.
At this time, a window appears and displays a message and the program name in the pause status.
To continue the execution, press the <CONTINUE> key, and the window disappears and the program is restarted.
When a program is executed by GP-IB, the "PAUSE" command is ignored and the next processing is performed.

6.5.4 Program execute error

When an error occurs during program execution, a window appears and displays a number indicating the type of the error and the execution is stopped.
Table 6-1 shows an error list.

NOTE

> *If a ERROR occurs during program execution, a window appears as usual and displays a number indicating the type of the error and a message, and the program execution is continued.*

- Classification of error numbers

  Error numbers are classified as follows.

  300 to 319 ....Error occurring upon execution of the setting that must not be operated manually
  320 to 339 ....Special command error
  340 to 359 ....I/O error
  360 to 379 ....Floppy disk error
  380 to 399 ....Other error

The above numbers can be read out as talk data in response to the GP-IB talker command "WARN?".

Table 6-1 Error Table for Program Execution (1/2)

No.	Message	Causes of occurrence
300	`Parameter out of range`	In a command whose parameter is set in a variable, the variable value is out of the range or undefined.
301	`Can't execute across mode`	In the normal display status, a command related to 3-dimensional display was executed.
302	`Scale unit mismatch`	In the "LINE MRK3 or 4" command, there is a mismatch in parameter unit between active trace and Y axis scale.
303	`No data in active trace`	Upon execution of the moving marker set command, peak search command or analysis command, no data exists in active trace.
304	`Maker value out of range`	In the moving marker or line wavelength marker set command, the specified wavelength is out of the sweep range.
305	`No data in trace A or B`	Upon execution of the "EDFA NF" command, no waveform data exists in trace A and B.
306	`Invalid data`	Upon execution of trace memory save or FD write processing, no data exists in trace.
307	`Unsuitable write item`	Upon execution of "WRITE DATA", all the data items are set at OFF.
308	`Unsuitable plot mode`	In the plot mode, no output item was selected.
320	`Undefined variable`	A command including an undefined variable was executed.
321	`Variable unit mismatch`	In a command including two or more variables, there is a mismatch in unit among variables.
322	`Overflow`	At arithmetic operations, an overflow occurred.
323	`Undefined marker variable`	When no marker is displayed, a command including a marker value variable was executed.
324	`Invalid marker variable`	Except immediately after execution of spectral width search or peak search, a command including the corresponding variable was executed.
325	`Undefined line number`	The jump destination of the GOTO command is not 1 to 2000.
326	`F1 greater than F2`	Upon execution of the "IF F1 < = @@@@@ < = F2" command, F1 > F2.

Table 6-1 Error Table for Program Execution (2/2)

No.	Message	Causes of occurrence
340	`Printer paper empty`	Printer record paper is used up.
341	`Printer head up`	Because the printer head-up lever is up, printing is impossible.
342	`Plotter address mismatched`	No X-Y plotter is connected or address setting is incorrect.
343	`Unsuitable plot mode`	When plot processing was executed by the X-Y plotter, no output item on the screen was set.
344	`Plotter error`	An error occurred on the X-Y plotter side.
345	`Option does not respond`	The external unit does not respond.
346	`Option is not connected`	No external unit is connected.
360	`Disk full`	The disk capacity is insufficient to create a file.
361	`Disk not inserted`	No floppy disk is inserted into the drive.
362	`Disk is write protected`	The floppy disk is set to write inhibit.
363	`Disk not initialized`	The floppy disk is not initialized. Or the format that cannot be used in this equipment is initialized.
365	`File not found`	The specified file is not found and data cannot be read out or no file is found on the disk.
366	`File is write protected`	The file is in the read-only attribute and data cannot be rewritten or deleted.
367	`No data`	No data to save is found.
368	`File is not a trace file`	The file is not a trace file and data cannot be read out.
369	`Illegal file name`	The file name is illegal and data cannot be saved.
380	`Undefined program`	The program was not registered at execution.
381	`Syntax error`	The command is incorrect. (The contents of the program ware changed for some reason.)

6.6 Description of Commands

The commands used in a program are classified into commands that are entered from the panel switch and special commands.

Table 6-2 shows a panel switch command list and Table 6-3 shows a special command list.

6.6.1 Description of variables

The variables usable in a program are described below.

Variable name	Contents
I	Enters a general purpose variable.
J	Enters a general purpose variable.
K	Enters a general purpose variable.
S	Performs serial polling and stores a received status byte and also used as a general-purpose variable.
X	Enters a general-purpose variable.
Y	Enters a general-purpose variable.
Z	Enters a general-purpose variable.
A$	Saves the data received by GP-IB 2 port.
FILE$	Enters the file name upon the last access to the floppy disk.
TIME$	Enters date and time (Example: 1994 Sep 08 20 : 45 : 37)
WM	Enters the wavelength value of the moving marker.
W1	Enters the wavelength value of fixed marker 1.
W2	Enters the wavelength value of fixed marker 2.
W2-W1	Enters wavelength difference between fixed marker 2 and 1.
LM	Enters the level value of the moving marker.
L1	Enters the level value of fixed marker 1.
L2	Enters the level value of fixed marker 2.
L2-L1	Enters the level difference between fixed marker 2 and 1.
SPWD	Enters the spectral width upon execution of spectral width search.
PKWL	Enters the peak (or bottom) wavelength value upon execution of peak (or bottom) search or spectral width search.
PKLVL	Enters the peak (or bottom) level value upon execution of peak (or bottom) search or spectral width search.
MODN	Enters the number of modes upon execution of spectral width search.

Variable name	Contents
SMSR	Enters the side mode suppression ratio (level difference) upon execution of SMSR measurement.
MKPWR	Enters the power upon execution of marker-to-marker power measurement.
DOMWL	Enters the dominant value upon execution of dominant wavelength measurement.
XCOL	Enters chromaticity coordinate value X when <COLOR ANALYSIS> is executed.
YCOL	Enters chromaticity coordinate value Y when <COLOR ANALYSIS> is executed.
ZCOL	Enters chromaticity coordinate value Z when <COLOR ANALYSIS> is executed.
EDFNF	Enters the NF value upon execution of EDFA NF measurement.
GAIN	Enters GAIN value when EDFA NF measurement is executed.
ASELV	Enters ASE LEVEL value when EDFA NF measurement is executed.
PWMTR	Enters the power value upon execution of measurement using the power meter function.

6.6.2 Rule of four operations by variables

The rule of giving units after arithmetic operations is shown below.

(1) Unit * No unit = Unit
(2) Unit / No unit = Unit
(3) No unit + No unit = No unit
(4) No unit – No unit = No unit
(5) No unit * No unit = No unit
(6) No unit / No unit = No unit
(7) nm + nm = nm
(8) nm – nm = nm
(9) nm / nm = No unit
(10) dB + dB = dB
(11) dB – dB = dB
(12) dBm + dB = dBm
(13) dBm – dB = dBm
(14) dBm – dBm = dB
(15) #W + #W = #W
(16) #W – #W = #W
(17) #W / #W = No unit

Units dBm/nm, W/nm, dB/km, and % are treated as dBm, W, dB and no unit, respectively during handling of variables.
The above operations are performed with variable unit and each unit is given to operation results.
If any other combination of variables is used for calculation (that is, if the variables having different units are operated), the calculation results have no unit.
The unit of variable "#W" is treated as follows:

1 mW = 1
1 µW = 0.001
1 nW = 0.000001
1 pW = 0.000000001

6.6.3 Specifications of "@=VAL (A$)" command

(1) Ignore the character strings except the number ahead of a numeric value (beginning with sign or number) in the character strings of the A$ command.
Convert the numbers before "," or the next character string or a delimiter.

(2) When no numeric value exists in the character strings of the A$ command, substitute "0" for the variable @.

Table 6-2 Panel Switch Command List (1/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
SWEEP	AUTO	AUTO	Auto sweep
	REPEAT	REPEAT	Repeat sweep
	STOP	STOP	Stop of sweep
	SEGMENT MEASURE	SEGMENT MEASURE	Measurement of the specified number of points starting from the wavelength position at a stop.
	SEG POINT ****	SEGMENT POINT ****	Specifies the number of points to be measured by <SEGMENT MEASURE>. 1 to 1001 (1 step)
	SWEEP MKR L1-L2 ###	SWEEP MKR L1-L2 ###	Selects ON or OFF for the marker-to-marker sweep function. For ###, select ON or OFF by rotary knob.
	SWP INTVL *****sec	SWP INTVL *****sec	Sets the interval time at repeat sweep. MINIMUM, 1 to 99999 sec (1 step) [MINIMUM when "0" is set.]
CENTER	CENTER ****.**nm	CENTER ****.**nm	Sets the mean wavelength. 350.00 to 1750.00 nm (0.01 step)
	CENTER @@@@@	CENTER WL @@@@@	Sets the variable @@@@@ value to the center wavelength. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, PKWL and DOMWL by rotary knob.
	START WL ****.**nm	START WL ****.**nm	Sets the measurement start wavelength. –400.00 to 1750.00 nm (0.01 step)
	STOP WL ****.**nm	STOP WL ****.**nm	Sets the measurement end wavelength. 350.00 to 2500.00 nm (0.01 step)
	PEAK → CENTER	PEAK → CENTER	Sets the peak wavelength of the waveform on active trance to the mean wavelength.
	AUTO CENTER ###	AUTO CENTER ###	Select ON or OFF for the peak → enter function to be executed at the end of each sweep. For ###, select ON or OFF by rotary knob.

Table 6-2 Panel Switch Command List (2/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
SPAN	SPAN ****.*nm	SPAN ****.*nm	Sets the span. 0, 0.1 to 1500.0 nm (0.1 step)
	SPAN @@@@@	SPAN @@@@@	Sets the variable @@@@@ value to the span. For @@@@@, select one of I, J, K, S, X, Y, Z, W2-W1 and SPWD variables by rotary knob.
	START WL ****.**nm	START WL ****.**nm	Sets the measurement start wavelength. –400.00 to 1750.00 nm (0.01 step)
	STOP WL ****.**nm	STOP WL ****.**nm	Sets the measurement end wavelength. 350.00 to 2500.00 nm (0.01 step)
	Δλ → SPAN	Δλ → SPAN	Performs spectral width search and sets the result as span.
	0nm SWEEP TIME **sec	0nm SWEEP TIME **sec	Sets the time for sweep at a span of 0 nm. MINIMUM, 1 to 50 sec (1 step) [MINIMUM when "0" is set.]
LEVEL	REF LEVEL ***.*dBm	REFERENCE LEVEL ***.*dBm	Sets the reference level value in the LOG scale mode. –90.0 to 20.0 dBm (0.1 step)
	REF LEVEL ***.*##	REFERENCE LEVEL ***.*##	Sets reference level value in the linear scale. 1.00 pW to 100 mW (1.00 to 9.99 [pW, mW, µW, mW]: 0.01 step, 10.0 to 99.9 (100) [pW, nW, µW, (mW)]: 0.1 step, 100 to 999 [pW, nW, µW]: 1 step) ## selects either one of pW, nW, µW or mW.
	REF LEVEL @@@@@	REF LEVEL @@@@@	Sets the variable @@@@@ value to the reference level value. For @@@@@, select one of I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR and ASELV variables by rotary knob.
	LVL SCALE **.*dB/D	LEVEL SCALE **.*dB/D	Sets the level scale value. LINEAR, 0.1 to 10.0 dB/DIV (0.1 step) [LINEAR when "0" is set.]

Table 6-2 Panel Switch Command List (3/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
LEVEL (cont.)	LVL SCALE @@@@@	LEVEL SCALE @@@@@	Sets the variable @@@@@ value to the level scale value. For @@@@@, select one of I, J, K, S, X, Y, Z, L2-L1, SMSR, EDFNF and GAIN variables by rotary knob.
	BASE LEVEL *****	BASE LEVEL *****	Sets the bottom value of linear scale. 0 to REF level (scale top value) × 0.9 The unit which has been set at REF level is used.
	PEAK → REF LEVEL	PEAK → REF LEVEL	Sets the peak level of the waveform on active trace to the reference level.
	AUTO REF LEVEL ###	AUTO REF LEVEL ###	Selects ON or OFF for the peak → center function to be executed at the end of each sweep. For ###, select ON or OFF by rotary knob.
	LEVEL UNIT ######	LEVEL UNIT ######	Sets the unit of level scale. dBm or dB/nm
	SUB LOG **.*dB/D	SUB SCALE LOG **.*dB/D	Sets the subscale value in the LOG scale mode. 0.1 to 10 dB/DIV (0.1 step)
	SUB SCL ***dB/km	SUB SCALE ***dB/km	Sets the subscale value in the dB/km scale mode. 0.1 to 10.0 dB/km/D (at 0.1 step)
	SUB LIN **.*/D	SUB SCALE LIN **.*/D	Sets the subscale value in the LIN scale mode. 0.005 to 1.250 (0.005 step)
	SUB SCL ****%/D	SUB SCALE ****%/D	Sets the subscale value in the % scale mode. 0.5 to 125.0%/D (at 0.1 step)
	OFST LVL ***.*dB	OFFSET LEVEL ***.*dB	Sets the subscale offset value in the LOG scale mode. –99.9 to 99.9 dB (0.1 step)
	OFST LVL ****dB/km	OFFSET LEVEL ****dB/km	Sets an offset of subscale in the dB/km scale mode. –99.9 to 99.9 dB/km (at 0.1 step)
	SCALE MIN ****	SUB SCALE MINIMUM ****	Sets the bottom value of subscale in linear scale mode. 0 to subscale value (/DIV) × 10
	SCALE MIN ****%	SUB SCALE MINIMUM ****%	Sets the bottom value of subscale in % scale mode. 0 to subscale value (/DIV) × 10
	LENGTH **.*** km	LENGTH **.*** km	Sets an optical fiber length. 0.001 to 99.999 km (at 0.001 step)

Table 6-2 Panel Switch Command List (4/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
LEVEL (cont.)	AUTO SUB SCALE ###	AUTO SUB SCALE ###	Selects ON or OFF for the auto subscale function to be executed at the end of each sweep. For ###, select ON or OFF by rotary knob.
SETUP	RESOLN **.*nm	RESOLUTION **.*nm	Sets the resolution. 0.05 to 10 nm (1-2-5 steps)
	RESOLN @@@@@	RESOLUTION @@@@@	Sets the variable @@@@@ value to the resolution. For @@@@@, select one of I, J, K, S, X, Y, Z, W2-W1 and SPWD variables by rotary knob.
	SENS NORM RANG HOLD	SENS NORMAL RANGE HOLD	Sets the measuring sensitivity to the normal fixed range mode.
	SENS NORM RANG AUTO	SENS NORMAL RANGE AUTO	Sets the measuring sensitivity to the normal auto range mode.
	SENS HIGH 1	SENS HIGH 1	Sets the measuring sensitivity to the high-sensitivity mode 1.
	SENS HIGH 2	SENS HIGH 2	Sets the measuring sensitivity to the high-sensitivity mode 2.
	SENS HIGH 3	SENS HIGH 3	Sets the measuring sensitivity to the high-sensitivity mode 3.
	AVERAGE TIMES ****	AVERAGE TIMES ****	Sets the number of averaging times. 1 to 1000 (1 step)
	AVERAGE TIMES @	AVERAGE TIMES @	Sets the averaging count in variable @. "@" can be I, J, K, S, X, Y, Z or N.
	SAMPLING PT ****	SAMPLING POINT ****	Sets the number of sampling points per sweep. 11 to 1001 (1 step)
	SAMPLING PT @	SAMPLING POINT @	Sets the sample count in variable @. "@" can be I, J, K, S, X, Y, Z, or N.
	CW LIGHT MEASURE	CW LIGHT MEASURE	Sets continuous light.
	PLS MEAS LPF	PULSE LIGHT MEASURE LPF MODE	Measures pulse light.
	PLS MEAS PK HOLD ****	PULSE LIGHT MEASURE PEAK HOLD MODE ****	Measures pulse light. 1 to 9999 (1 step)
	PLS MEAS EXT TRG	PULSE LIGHT MEASURE EXT TRG MODE	Measures pulse light.
	MONOCHRO SGL	MONOCHRO SINGLE	Sets to the single monochromator.
	MONOCHRO DBL	MONOCHRO DOUBLE	Sets to the double monochromator.
	CHOP INT	CHOP INTERNAL	Sets internal light chopping at high-sensitivity measurement.

Table 6-2 Panel Switch Command List (5/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
SETUP (cont.)	CHOP EXT	CHOP EXTERNAL	Sets external light chopping at high-sensitivity measurement.
MARKER	MARKER ****.***nm	MARKER ****.***nm	Sets the marker to the specified wavelength position of the active trace waveform. (by wavelength value) –400.000 to 2500.000 nm (0.001 step)
	MARKER ****.****THz	MARKER ****.****THz	Sets the marker to the specified wavelength position of the active trace waveform. (by frequency value) 110.0000 to 9999.9990 THz (0.0001 step)
	MARKER @@@@	MARKER @@@@	Sets marker to wavelength position of variable @@@@. For @@@@, one of variables I, J, K, S, X, Y, Z, WM, W1, W2, PKWL or DOMWL shall be selected using the rotary knob.
	MARKER → CENTER	MARKER → CENTER	Sets the marker wavelength value to the center wavelength.
	MARKER → REF LEVEL	MARKER → REF LEVEL	Sets the marker level value to the reference level.
	SET MARKER 1	SET MARKER 1	Sets the marker to the fixed marker 1.
	SET MARKER 2	SET MARKER 2	Sets the marker to the fixed marker 2.
	MARKER CLEAR	MARKER CLEAR	Clears the marker.
	MKR UNIT nm	MARKER UNIT nm	Sets the marker X-axis unit to wavelength.
	MKR UNIT THz	MKRKER UNIT THz	Sets the marker X-axis unit to frequency.
	LINE MKR1 ****.***nm	LINE MARKER1 ****.***nm	Sets the line marker 1 to the specified wavelength. –400.000 to 2500.000 nm (0.001 step)
	LINE MKR1 ****.****THz	LINE MARKER1 ****.****THz	Sets line marker 1 to specified frequency. 110.0000 to 9999.9990 THz (0.0001 step)
	LINE MKR1 @@@@@	LINE MARKER1 @@@@@	Sets the line marker 1 to the wavelength position of the variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, PKWL and DOMWL variables by rotary knob.
	LINE MKR2 ****.***nm	LINE MARKER2 ****.***nm	Sets the line marker 2 to the specified wavelength. –400.000 to 2500.000 nm (0.001 step)

Table 6-2 Panel Switch Command List (6/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
MARKER (cont.)	LINE MKR2 ****.****THz	LINE MARKER2 ****.****THz	Sets line marker 2 to specified frequency. 110.0000 to 9999.9990 THz (0.0001 step)
	LINE MKR2 @@@@@	LINE MARKER2 @@@@@	Sets the line marker 2 to the wavelength position of the variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, PKWK and DOMWL variables by rotary knob.
	LINE MKR3 ****.***dB	LINE MARKER3 ****.***dB	Sets the line marker 3 to the specified level. –139.900 to 139.900 dB (0.001 step)
	LINE MKR3 ****.**dBm	LINE MARKER3 ****.**dBm	Sets the line marker 3 to the specified level.. –150.00 to 40.00 dBm (0.01 step)
	LINE MKR3 *.****##	LINE MARKER3 *.****##	Sets the line marker 3 to the specified level. 0 to 9.9999 (0.001 step) For ##, select one of pW, nW, µW, mW and W by rotary knob.
	LINE MKR3 **.***	LINE MARKER3 **.***	Sets the line marker 3 to the specified level. 0 to 10.000 (0.001 step)
	LINE MKR3 @@@@@	LINE MARKER3 @@@@@	Sets the line marker 3 to the level position of the variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR and ASELV variable by rotary knob.
	LINE MKR4 ****.***dB	LINE MARKER4 ****.***dB	Sets the line marker 4 to the specified level. –139.900 to 139.900 dB (0.001 step)
	LINE MKR4 ****.**dBm	LINE MARKER4 ****.**dBm	Sets the line marker 4 to the specified level. –150.00 to 40.00 dBm (0.01 step)
	LINE MKR4 *.****##	LINE MARKER4 *.****##	Sets the line marker 4 to the specified level. 0 to 9.9999 (0.001 step) For ##, select one of pW, nW, µW, mW and W by rotary knob.
	LINE MKR4 **.***	LINE MARKER4 **.***	Sets the line marker 4 to the specified level. 0 to 10.000 (0.001 step)
	LINE MKR4 @@@@@	LINE MARKER4 @@@@@	Sets the line marker 4 to the level position of the variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR and ASELV variable by rotary knob.

Table 6-2 Panel Switch Command List (7/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
MARKER (cont.)	`MKR L1-L2 → SPAN`	`MKR L1-L2 → SPAN`	Sets the range enclosed by the line markers 1 and 2 to the span.
	`SEARCH L1-L2 ###`	`SEARCH L1-L2 ###`	Selects ON or OFF for the analysis function in the range enclosed by the line markers 1 and 2. For ###, select ON or OFF by rotary knob.
	`LINE MKR CKEAR`	`LINE MARKER CLEAR`	Clears the line mark.
PEAK SEARCH	`PEAK SEARCH`	`PEAK SEARCH`	Executes peak search for the waveform on active trace.
	`BOTTOM SEARCH`	`BOTTOM SEARCH`	Executes bottom search for the waveform on active trace.
	`NEXT SRCH`	`NEXT SEARCH`	Searches the peak/bottom subsequect to the marker of the waveform on active trace.
	`NEXT SRCH RIGHT`	`NEXT SEARCH RIGHT`	Searches the peak/bottom at the right of the marker of the waveform on active trace.
	`NEXT SRCH LEFT`	`NEXT SEARCH LEFT`	Searches the peak/bottom at the left of the marker of the waveform on active trace.
	`SET MARKER 1`	`SET MARKER 1`	Specifies the marker as fixed marker 1.
	`SET MARKER 2`	`SET MARKER 2`	Specifies the marker as fixed marker 2.
	`MARKER CLEAR`	`MARKER CLEAR`	Clears the marker.
	`AUTO SEARCH ###`	`AUTO SEARCH ###`	Selects ON or OFF for the peak/bottom search function to be executed at each sweep. For ###, select ON or OFF by rotary knob.
	`MODE DIFF **.**dB`	`MODE DIFF **.**dB`	Sets the level difference of mode criterion to be used for peak search or waveform analysis. 0 to 50.00 dB (0.01 setup)

Table 6-2 Panel Switch Command List (8/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
ANALYSIS	ENV TH1 **.*dB	ENV TH1 **.*dB	Makes spectral width search by the envelope method with the specified threshold value. 0.1 to 10.0 dB (0.1 step)
	ENV TH2 **.*dB	PARAM ENV TH2 **.*dB	Sets the limit value of the spectral width search by the envelope method. 0.1 to 30.0 dB(0.1 step)
	ENV K **.**	PARAM ENV K **.**	Sets the magnification of the spectral width search by the envelope method. 0.01 to 10.00 (0.01 step)
	THRESH TH **.*dB	THRESH TH **.*dB	Makes spectral width search by the THRESH method with the specified threshold value. 0.1 to 50.0 dB (0.1 step)
	THRESH K **.**	PARAM THRESH K **.**	Sets the magnification of the spectral width search by the THRESH method. 0.01 to 10.00 (0.01 step)
	MODE FIT ###	PARAM THRESH MODE FIT ###	Sets ON or OFF for the marker mode peak set function upon execution of spectral width search by the THRESH method. For ###, select ON or OFF by rotary knob.
	RMS TH **.*dB	RMS TH **.*dB	Makes spectral width search by the RMS method with the specified threshold value. 0.1 to 30.0 dB (0.1 step)
	RMS K **.**	PARAM RMS K **.**	Sets the magnification of the spectral width search by the RMS method. 0.01 to 10.00 (0.01 step)
	PK RMS TH **.*dB	PK RMS TH **.*dB	Makes spectral width search by the PEAK-RMS method. 0.1 to 30.0 dB (0.1 step)
	PK RMS K **.**	PARAM PEAK RMS K **.**	Sets the magnification of the spectral width search by the PEAK-RMS method. 0.01 to 10.00 (0.01 step)
	SPEC WD NOTCH ***dB	SPEC WD NOTCH ***dB	Measures the notch width based on the specified threshold. 0.1 to 50.0 dB (at 0.1 step)

Table 6-2 Panel Switch Command List (9/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
ANALYSIS (cont.)	SMSR MODE *	SMSR MODE *	Makes side mode suppression ratio measurement by specifying a mode. 1.2
	SMSR MASK ±**.**nm	SMSR MASK ±**.**nm	Sets the mask range upon execution of SMSR 1 mode. 0 to 99.99 nm (0.01 step)
	POWER	POWER	Makes power measurement.
	PWR OFST ***.**dB	PARAM POWER OFST ***.**dB	Sets the offset value at power measurement. –10.00 to 10.00 dB (0.01 step)
	FP-LD ANALYSIS	FP-LD ANALYSIS	Makes an analysis required for FP-LD.
	DFB-LD ANALYSIS	DFB-LD ANALYSIS	Makes an analysis required for DFB-LD.
	LED ANALYSIS	LED ANALYSIS	Makes an analysis required for LED.
	COLOR ANALYSIS	COLOR ANALYSIS	Makes an color analysis.
	EDFA OFST (IN) ***.**	EDFA NF TRACE A OFST ***.**dB	Sets offset value of signal light which is used in calculation of NF and gain. –99.99 to 99.99 dB
	EDFA OFST (OUT) ***.**	EDFA NF TRACE B OFST ***.**dB	Sets offset value of output light which is used in calculation of NF and gain. –99.99 to 99.99 dB
	EDFA PLUS MASK **.**	EDFA NF PLUS MASK **.**nm	In the ASE level measurement, mask range above peak wavelength is specified to perform NF measurement of optical amplifier. 0 to 10.00 nm (0.01 step)
	EDFA MINUS MASK **.**	EDFA NF MINUS MASK **.**nm	In the ASE level measurement, mask range below peak wavelength is specified to perform NF measurement of optical amplifier. 0 to 10.00 nm (0.01 step)
	EDFA CVFT TYPE GAUS	EDFA NF CURVE FIT TYPE GAUSSIAN	Sets type of curve fit to GAUSSIAN (normal distribution curve) for NF calculation.
	EDFA CVFT TYPE LORENZ	EDFA NF CURVE FIT TYPE LORENZIAN	Sets type of curve fit to LORENIZIAN (Lorenz curve) for NF calculation.
	EDFA CVFT TYPE 3rd POLY	EDFA NF CURVE FIT TYPE 3RD POLY	Sets type of curve fit to 3RD POLY (cubic expression) for NF calculation.

Table 6-2 Panel Switch Command List (10/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
ANALYSIS (cont.)	EDFA CVFT TYPE 4th POLY	EDFA NF CURVE FIT TYPE 4TH POLY	Sets type of curve fit to 4TH POLY (biquadratic expression) for NF calculation.
	EDFA CVFT TYPE 5th POLY	EDFA NF CURVE FIT TYPE 5TH POLY	Sets type of curve fit to 5TH POLY (pentagonal expression) for NF calculation.
	EDFA CVFT THR **.*	EDFA NF CURVE FIT THRESH **.*dB	Sets threshold for curve fit in NF calculation. 0.1 to 99.9 dB (0.1 step)
	WDM ANALYSIS	WDM ANALYSIS	Performs WDM analysis.
	WDM REF HIGHEST	WDM REF CHANNEL HIGHEST	Sets the reference channel of WDM analysis to the peak.
	WDM REF ****.**nm	WDM REF CHANNEL ****.**nm	Sets the reference channel of WDM analysis in wavelength. 350.000 to 1750.000 nm (at 0.001 step)
	WDM REF NO **	WDM REF CHANNEL NO.**	Sets the reference channel of WDM analysis. 1 to 99 (at 1 step)
	WDM THRESH **.*dB	WDM THRESH **.*dB	Sets the WDM analysis threshold. 0.1 to 50.0 dB (at 0.1 step)
	WDM MAX ***	WDM MAX NUMBER ***	Sets the maximum number of channels for WDM analysis. 1 to 99 channels (at 1 step)
	WDM DIFF **.*dB	WDM MODE DIFF **.*dB	Sets the minimum difference between top and bottom waveforms for WDM analysis. 0 to 50.0 dB (at 0.1 step)
	WDM OFFSET LIST	WDM OFFSET LIST	Displays an offset from the reference channel during WDM analysis.
	WDM SPACING LIST	WDM SPACING LIST	Displays an offset from the adjacent channel during WDM analysis.
	MAKER CLEAR	MAKER CLEAR	Clears the marker.
	AUTO ANALYSIS ###	AUTO ANALYSIS ###	Selects ON or OFF for the wave analysis function to be executed at sweep. For ###, select ON or OFF by rotary knob.

Table 6-2 Panel Switch Command List (11/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
TRACE	WRITE A	WRITE	Sets the trace A to the write mode.
	FIX A	FIX A	Sets the trace A to the fixed data mode.
	MAX HOLD A	MAX HOLD A	Sets the trace A to the maximum value detection mode.
	ROLL AVG A ***	ROLL AVG A ***	Sets the trace A to the sequential averaging mode. 2 to 100 (1 step)
	DISPLAY A	DISPLAY A	Sets the trace A to the data display mode.
	BLANK A	BLANK A	Sets the trace A to the data non-display mode.
	ACTIVE TRACE A	ACTIVE TRACE A	Sets the trace A to the active trace.
	WRITE B	WRITE B	Sets the trace B to the write mode.
	FIX B	FIX B	Sets the trace B to the fixed data mode.
	MIN HOLD B	MIN HOLD B	Sets the trace B to the minimum value detection mode.
	ROLL AVG B ***	ROLL AVG B ***	Sets the trace B to the sequential averaging mode. 2 to 100 (1 step)
	DISPLAY B	DISPLAY B	Sets the trace B to the data display mode.
	BLANK B	BLANK B	Sets the trace B to the data non-display mode.
	ACTIVE TRACE B	ACTIVE TRACE B	Sets the trace B to the active trace.
	WRITE C	WRITE C	Sets the trace C to the write mode.
	FIX C	FIX C	Sets the trace C to the fixed data mode.
	A-B → C	A-B → C	Sets the trace C to the trace A-B subtraction display mode (LOG).
	B-A → C	B-A → C	Sets the trace C to the trace B-A subtraction display mode (LOG).
	A-B(LIN) → C	A-B(LIN) → C	Sets the trace C to the trace A-B subtraction display mode (LIN).
	B-A(LIN) → C	B-A(LIN) → C	Sets the trace C to the trace B-A subtraction display mode (LIN).
	A+B(LIN) → C	A+B(LIN) → C	Sets the trace C to the trace A+B subtraction display mode (LIN).
	NORMALIZE C	NORMALIZE C	Sets the trace C to the normalization waveform display mode.

Table 6-2 Panel Switch Command List (12/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
TRACE (cont.)	DOMIANT C	DOMIANT C	Sets the trace C to the spectral luminous efficacy compensation waveform display mode.
	CURVE FIT C **dB	CURVE FIT C **dB	Sets the trace C to the curve fit display mode. 0 to 99 dB (1 step)
	CURVE FIT PK C **dB	CURVE FIT PK C **dB	Sets the trace C to the peak curve fit display mode. 0 to 99 dB (1 step)
	DISPLAY C	DISPLAY C	Sets the trace C to the data display mode.
	BLANK C	BLANK C	Sets the trace C to the data non-display mode.
	ACTIVE TRACE C	ACTIVE TRACE C	Sets the trace C to the active trace.
	TRACE A → B	TRACE A → B	Copies the trace A to the trace B.
	TRACE A → C	TRACE A → C	Copies the trace A to the trace C.
	TRACE B → A	TRACE B → A	Copies the trace B to the trace A.
	TRACE B → C	TRACE B → C	Copies the trace B to the trace C.
	TRACE C → A	TRACE C → A	Copies the trace C to the trace A.
	TRACE C → B	TRACE C → B	Copies the trace C to the trace B.
DISPLAY	NORMAL DISPLAY	NORMAL DISPLAY	Sets the screen to the normal display mode.
	SPLIT DISPLAY	SPLIT DISPLAY	Sets the screen to the 2-split display mode.
	TRACE A UP	TRACE A UPPER	Sets the trace A to the upper screen of 2-split display.
	TRACE A LOW	TRACE A LOWER	Sets the trace A to the lower screen of 2-split display.
	TRACE B UP	TRACE B UPPER	Sets the trace B to the upper screen of 2-split display.
	TRACE B LOW	TRACE B LOWER	Sets the trace B to the lower screen of 2-split display.
	TRACE C UP	TRACE C UPPER	Sets the trace C to the upper screen of 2-split display.
	TRACE C LOW	TRACE C LOWER	Sets the trace C to the lower screen of 2-split display.
	UPPER HOLD ###	UPPER HOLD ###	Fixes the upper screen of 2-split display.
	LOWER HOLD ###	LOWER HOLD ###	Fixes the lower screen of 2-split display.

Table 6-2 Panel Switch Command List (13/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
DISPLAY (cont.)	`3D DISPLAY`	`3D DISPLAY`	Sets the screen to 3-dimensional display mode.
	`3D ANGLE **`	`3D ANGLE **`	Sets the angle of 3-dimensional display. +50 to –50 deg (10 steps)
	`3D RECALL`	`3D RECALL`	Redisplays 3-dimensional display waveforms.
	`3D Z-SCALE **`	`3D Z-SCALE **`	Sets the number of waveforms of 3-dimensional display. 3 to 16 (1 step)
	`3D MEMORY 1st`	`3D MEMORY 1st`	Sets the buffer memory to be used for 3-dimensional display to 0 to 15.
	`3D MEMORY 2nd`	`3D MEMORY 2nd`	Sets the buffer memory to be used for 3-dimensional display to 16 to 31.
	`LABEL'--------------'`	`LABEL'-----------` 50 characters -----------'	Displays a comment in the label area. When a semicolon ";" is added to the end of the command, the comment (variable value) specified by the next LABEL command is displayed in succession.
	`LABEL @@@@@`	`LABEL @@@@@`	Displays the contents of the variable @@@@@ in the label area. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2 L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV, PWMTR, A$, FILE$ and TIME$ variables by rotary knob.
	`LABEL @@@@@;`	`LABEL @@@@@;`	Display the contents of the variable @@@@@ by label. The comment (variable value) specified by the next LABEL command is displayed in succession.
	`LABEL CLEAR`	`LABEL CLEAR`	Clear the label.
	`NOISE MASK ***dB`	`NOISE MASK ***dB`	Masks and displays the waveform data that is less than the specified level. OFF, 0 to –100 dBm (1 step)
	`GRAPH CLEAR`	`GRAPH CLEAR`	Clears the waveforms of trace A, B and C and also data.

Table 6-2 Panel Switch Command List (14/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
MEMORY	SAVE A → MEM **	SAVE A → MEM **	Writes the waveform of trace A into the memory of the specified number. 0 to 31 (1 step)
	SAVE A → MEM @	SAVE A → MEM @	Writes the waveform of trace A into the memory of the number in variable @. For @, select of I, J, K, S, X, Y and Z variables by rotary knob.
	SAVE B → MEM **	SAVE B → MEM **	Writes the waveform of trace B into the memory of the specified number. 0 to 31 (1 step)
	SAVE B → MEM @	SAVE B → MEM @	Writes the waveform of trace B into the memory of the number in variable @. For @, select of I, J, K, S, X, Y and Z variables by rotary knob.
	SAVE C → MEM **	SAVE C → MEM **	Writes the waveform of trace C into the memory of the specified number. 0 to 31 (1 step)
	SAVE C → MEM @	SAVE C → MEM @	Writes the waveform of trace C into the memory of the number in variable @. For @, select of I, J, K, S, X, Y and Z variables by rotary knob.
	RECALL MEM ** → A	RECALL MEM ** → A	Reads the waveform of the memory of the specified memory into the trace A. 0 to 31 (1 step)
	RECALL MEM @ → A	RECALL MEM @ → A	Reads the waveform of the memory of the number in variable @ into the trace A. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob.
	RECALL MEM ** → B	RECALL MEM ** → B	Reads the waveform of the memory of the specified memory into the trace B. 0 to 31 (1 step)
	RECALL MEM @ → B	RECALL MEM @ → B	Reads the waveform of the memory of the number in variable @ into the trace B. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob.
	RECALL MEM ** → C	RECALL MEM ** → C	Reads the waveform of the memory of the specified number into the trace C. 0 to 31 (1 step)

Table 6-2 Panel Switch Command List (15/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
MEMORY (cont.)	RECALL MEM @ → C	RECALL MEM @ → C	Reads the waveform of the memory of the number in variable @ into the trace C. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob.
FLOPPY	WRITE TRACE A '#####	WRITE TRACE A '########.WA*'	Writes the waveform of trace A into the floppy disk by specifying a file name. '########': File name
	WRITE TRACE A	WRITE TRACE A	Writes the waveform of trace A into the floppy disk. A file name is automatically given. ("W****")
	WRITE TRACE B '#####	WRITE TRACE B '########.WA*'	Writes the waveform of trace B into the floppy disk by specifying a file name. '########': File name
	WRITE TRACE B	WRITE TRACE B	Writes the waveform of trace B into the floppy disk. A file name is automatically given. ("W****")
	WRITE TRACE C '#####	WRITE TRACE C '########.WA*'	Writes the waveform of trace C into the floppy disk by specifying a file name. '########': File name
	WRITE TRACE C	WRITE TRACE C	Writes the waveform of trace C into the floppy disk. A file name is automatically given. ("W****")
	TRACE WRITE BINARY	TRACE WRITE:BINARY	Sets the format for writing trace waveform into the floppy disk to binary.
	TRACE WRITE TEXT	TRACE WRITE:TEXT	Sets the text format to write the trace waveforms on a floppy disk.
	TRACE WRITE ASCII	TRACE WRITE:ASCII	Sets the format for writing trace waveforms into the floppy disk to ASCII.
	WRITE MEMORY** '####	WRITE MEMORY** '########.WA'	Enters a file name and writes the memory of the specified number into the floppy disk. **: 0 to 31, '########': File name
	WRITE MEMORY**	WRITE MEMORY**	Writes the memory of the specified number into the floppy disk. **: 0 to 31. A file name is automatically given. ("W****")
	WRITE MEMORY @	WRITE MEMORY @	Writes the memory of the number in variable @ into the floppy disk. A file name is automatically given. For @, select of I, J, K, S, X, Y and Z variables by rotary knob.

Table 6-2 Panel Switch Command List (16/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
FLOPPY (cont.)	WRITE 3D 1st '######	WRITE 3D 1st '########.3D'	Writes 3-dimensional display waveforms (0 to 15) into the floppy disk by specifying a file name. '########': File name
	WRITE 3D 1st	WRITE 3D 1st	Writes 3-dimensional display waveforms (0 to 15) into the floppy disk. A file name is automatically given. ("T****")
	WRITE 3D 2nd '######	WRITE 3D 2nd '########.3D'	Writes 3-dimensional display waveforms (16 to 31) into the floppy disk by specifying a file name. '########': File name
	WRITE 3D 2nd	WRITE 3D 2nd	Writes 3-dimensional display waveforms (16 to 31) into the floppy disk. A file name is automatically given. ("T****")
	WRITE DATA '######	WRITE DATA '########.DAT'	Writes the contents of the data area into the floppy disk by specifying a file name. '########': File name
	WRITE DATA	WRITE DATA	Writes the contents of the data area into the floppy disk A file name is automatically given. ("D****")
	DATA DATE&TIME ###	DATA DATE&TIME ###	Selects date and time as data for writing by the <WRITE DATA> key. For ###, select ON of OFF by rotary knob.
	DATA LABEL ###	DATA LABEL ###	Select label information as data for writing by the <WRITE DATA> key. For ###, select ON or OFF by rotary knob.
	DATA DT AREA ###	DATA DT AREA ###	Selects the contents of the data area as data for writing by the <WRITE DATA> key. For ###, select ON or OFF by rotary knob.
	DATA CONDTN ###	DATA CONDITION ###	Selects measuring conditions as data for writing by the <WRITE DATA> key. For ###, select ON or OFF by rotary knob.
	DATA:ADD WRITE	DATA:ADD WRITE	Selects the additional writing of data files.
	DATA:OVERWRITE	DATA:OVERWRITE	Selects the overwriting of data files.
	WRITE GRAPH '########	WRITE GRAPH '########.***'	Specifies the file name and stores it on a floppy disk. '########': File name
	WRITE GRAPH	WRITE GRAPH	Stores a graphic file on a floppy disk. The file is named automatically.
	GRAPH COLOR:B&W	GRAPH COLOR:B&W	Sets the graphic file(s) to the monochrome mode.

Table 6-2 Panel Switch Command List (17/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
FLOPPY (cont.)	GRAPH COLOR:PRESET	GRAPH COLOR:PRESET	Sets the graphic file(s) to the preset color mode.
	GRAPH COLOR:SCREEN	GRAPH COLOR:SCREEN	Sets the graphic file(s) to the screen color mode.
	GRAPH TYPE:BMP	GRAPH TYPE:BMP	Specifies the BMP graphic file format.
	GRAPH TYPE:TIFF	GRAPH TYPE:TIFF	Specifies the TIFF graphic file format.
	WRITE SETTING '#####	WRITE SETTING '########.SET'	Writes measuring conditions, soft key latch status and user key registration information into the floppy disk by specifying a file name. '########': File name
	WRITE SETTING	WRITE SETTING	Writes measuring conditions, soft key latch status and user key registration information into the floppy disk. A file name is automatically given. ("S****")
	READ TRACE A '#.WA*	READ TRACE A '########.WA*'	Reads a waveform form the floppy disk into the trace A. '########.WA*': File name
	READ TRACE B '#.WA*	READ TRACE B '########.WA*'	Reads waveform from the floppy disk into the trace B. '########.WA*': File name
	READ TRACE C '#.WA*	READ TRACE C '########.WA*'	Reads waveform from the floppy disk into the trace C. '########.WA*': File name
	READ MEMORY** '#.WA*	READ MEMORY** '########.WA*'	Reads a waveform from the floppy disk into the floppy disk. **: 0 to 31, '########.WA*': File name
	READ 3D 1st '#######	READ 3D F '########.3D'	Reads 3-dimensional waveforms (0 to 15) from the floppy disk. '########.3D': File name
	READ 3D 2nd '#######	READ 3D S '########.3D'	Reads 3-dimensional waveforms (16 to 31) from the floppy disk. '########.3D': File name
	READ DATA '########	READ DATA '#########.DAT'	Reads and displays data from the floppy disk. '########.DAT': File name
	READ SETTING '######	READ SETTING '########.SET'	Reads and sets measuring conditions, soft key latch status and user key registration information from the floppy disk. '########.SET': File name
	DELETE '#######	DELETE '########.$$$'	Deletes a file in the floppy disk. '########.$$$': File name
	DISK INITIALIZE 1.2M	DISK INITIALIZE 1.2M	Initializes the floppy disk in the 1.2M byte mode.
	DISK INITIALIZE 1.44M	DISK INITIALIZE 1.44M	Initializes the floppy disk in the 1.44M byte mode.

Table 6-2 Panel Switch Command List (18/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
SYSTEM	COPY KEY PRINT	COPY KEY PRINT	Sets the [COPY] key to printer output.
	COPY KEY PLOT	COPY KEY PLOT	Sets the [COPY] key to X-Y plotter output.
	PLOT TRACE ###	PLOT TRACE ###	Outputs a trace in the plot mode. For ###, select ON or OFF by rotary knob.
	PLOT SCALE ###	PLOT SCALE ###	Outputs a scale (wavelength axis/level axis) in the plot mode. For ###, select ON or OFF by rotary knob.
	PLOT GRID ###	PLOT GRID ###	Outputs a grid in the plot mode. For ###, select ON or OFF by rotary knob.
	PLOT CONDITION ###	PLOT CONDITION ###	Outputs measuring conditions, label information and date/time in the plot mode. For ###, select ON or OFF by rotary knob.
	PLOT MARKER ###	PLOT MARKER ###	Outputs markers in the plot mode. For ###, select ON or OFF by rotary knob.
	PLOT OTHERS ###	PLOT OTHERS ###	Outputs a mark display and soft keys in the plot mode. For ###, select ON or OFF by rotary knob.
	PRINTER SAVE SPACE	PRINTER SAVE SPACE	Sets the amount of paper feed after printing to a low value.
	PRINTER NORMAL SPACE	PRINTER NORMAL SPACE	Sets the amount of paper feed after printing to a high value.
	PLOTTER ADRS **	PLOTTER ADRS **	Sets the address of the X-Y plotter. 0 to 29 (1 step)
	PEN SEL ****	PEN SELECT ****	Selects a pen number to be used in the plot mode. AUTO, 1 to 9 (1 step) [AUTO when "0" is set.]
	PLOTTER AT FEED ###	PLOTTER AUTO FEED ###	Uses the auto feed function of the plotter in the plot mode. For ###, select ON or OFF by rotary knob.
	DEFAULT COLOR *	DEFAULT COLOR *	Selects a display color among the default 5 patterns. 1 to 5
	MEAS WL AIR	MEASURE WAVELENGTH AIR	Sets measurement wavelength to air wavelength
	MEAS WL VACUUM	MEASURE WAVELENGTH VACUUM	Sets measurement wavelength to vacuum wavelength

Table 6-2 Panel Switch Command List (19/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
SYSTEM (cont.)	WL CAL ****.***nm	WL CAL ****.***nm	Sets the wavelength of light source to perform waveform absolute value calibration. 350.000 to 1750.000 nm (0.001 step)
	WL SHIFT **.**nm	WL SHIFT **.**nm	Sets the amount of wavelength shift. –5.00 to 5.00 nm (0.01 step)
	LEVEL SHIFT ***.**dB	LEVEL SHIFT ***.**dB	Sets the amount of level shift. –30.00 to 30.00 dB (0.01 step)
	AUTO OFFSET ###	AUTO OFFSET ###	Selects ON or OFF for the function to periodically cancel the DC offset of the AMP. For ###, select ON or OFF by rotary knob.
	BUZZER CLICK ###	BUZZER CLICK ###	Generates a click sound when a key is pressed. For ###, select ON or OFF by rotary knob.
	BUZZER WARNING ###	BUZZER WARNING ###	Activates the buzzer upon occurrence of a warning error. For ###, select ON or OFF by rotary knob.
ADVANCE	POWER METER REPEAT	POWER METER REPEAT	Makes repeat measurement by the power meter function.
	POWER METER SINGLE	POWER METER SINGLE	Makes single measurement by the power meter function.
	POWER METER STOP	POWER METER STOP	Stops measurement by the power meter function.
	AREA 350-700	AREA 350-700	Sets the wavelength range to 350 to 700 nm by the power meter function.
	AREA 600-1000	AREA 600-1000	Sets the wavelength range to 600 to 1000 nm by the power meter function.
	AREA 1000-1750	AREA 1000-1750	Sets the wavelength range to 1000 to 1750 nm by the power meter function.
	AREA FULL	AREA FULL	Sets the wavelength range to FULL (350 to 1750 nm) by the power meter function.
	RELATIVE ###	RELATIVE ###	Selects ON or OFF for the relative value display function by the power meter function. For ###, select ON or OFF by rotary knob.

Table 6-2 Panel Switch Command List (20/20)

Panel switch	Soft key list display	Program area display	Explanation and range of parameter
ADVANCE (cont.)	MAX MIN RESET	MAX MIN RESET	Selects the maximum value and minimum value by the power meter function.
	POWER METER UNIT dBm	POWER METER UNIT dBm	Sets the unit to "dBm" by the power meter function.
	POWER METER UNIT W	POWER METER UNIT W	Sets the unit to "W" by the power meter function.
	OUTPUT WL ****.***nm	OUTPUT WAVELENGTH ****.***nm	Sets the wavelength to be output by the optical output function. 350.000 to 1750.000 (0.001 step) (AQ-6315B only)
	OUTPUT WL @@@@@	OUTPUT WAVELENGTH @@@@@	Sets the wavelength to be output by the optical output function in variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, PKWL, DOMWL, XCOL, YCOL and ZCOL variables by rotary knob. (AQ-6315B only)
	OUTPUT BW **.**nm	OUTPUT BAND WIDTH **.**nm	Sets the band width for output by the optical output function. 0.05 to 10.0 (1-2-5 steps) (AQ-6315B only)
	OUTPUT BW @@@@@	OUTPUT BAND WIDTH @@@@@	Sets the band width for output by the optical output function in variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y, Z, W2-W1 and SPWD variables by rotary knob. (AQ-6315B only)
	BEAM ALIGNMENT ****	BEAM ALIGNMENT ****	Sets the optical axis adjustment value of the output section of the optical output function. -200 to 200 (AQ-6315B only)
	BEAM ALIGNMENT @@@@@	BEAN ALIGNMENT @@@@@	Sets the optical axis adjustment value of the output section of the optical output function in variable @@@@@. For @@@@@, select one of I, J, K, S, X, Y and Z variables by rotary knob. (AQ-6315B only)
COPY	None	COPY ON	Performs screen hard copy processing by printer or plotter.
FEED	None	PRINTER FEED **	Feeds printer paper. (1 to 10, 1 step) The amount of feed is about 5 mm per step.

Table 6-3 Special Command List (1/5)

Command list display	Program area display	Explanation and precaution of command (including parameter range)
GOTO ***	GOTO ***	Jumps to the *** line. (1 to 200, 1 step)
GOTO PROGRAM **	GOTO PROGRAM **	**: (1 to 20, 1 step) Jumps to program ** and starts execution from the first line. Jumps back to original program when contents of program ** has been executed. However, if END command is populated in the program **, this program ends without causing jump to the original program. When a program is executed with this command, variables are not initialized.
WAIT *****S	WAIT *****S	Waits for ***** seconds. (1 to 99999.1 step)
PAUSE'---------------'	PAUSE'------------ 50 characters ------------ '(Message to be displayed at a stop)	Causes execution to pause and displays a message window. In the window, the message in ' ' and an explanation of the <CONTINUE> key are displayed. When the soft key <CONTINUE> is pressed, the window is closed and the execution is restarted. However, when the program is started by GP-IB, it cannot pause.
VARIABLE CLEAR	VARIABLE CLEAR	All variables used in a program are initialized.
END	END	Terminates a program.
N=********	N=********	Substitutes a value for the variable N. (1 to 99999999, 1 step)
N=N-1;IF N<>0 GOTO ***	N=N-1;IF N<>0 GOTO ***	(1 to 200, 1 step) Subtracts 1 from the variable N. When the result is not 0, a jump takes place to the *** line.
@=********** ###	@=********** ###	Substitutes a value for the variable @. For **-**, a real number of up to 10 digits including a sign and a decimal point can be set. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob. For ###, select one of nm, THz, dB, dBm, pW, nW, µW, mW, W and ' ' (no unit) by rotary knob.
@=#+********** ###	@=#+********** ###	Adds the **-** value to the variable # and substitutes the result for the variable @. For **-**, a real number of up to 10 digits including a sign and a decimal point can be set. When a minus value is set, subtraction is performed from the variable #. For @, #, select one of I, J, K, S, X, Y and Z variables by rotary knob.

Table 6-3 Special Command List (2/5)

Command list display	Program area display	Explanation and precaution of command (including parameter range)
@=@@@@@	@=@@@@@	Copies the contents of the variable @@@@@ to the variable @. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
@=@@@@@+#####	@=@@@@@+#####	Performs four operations between variables. For @. select one of I, J, K, S, X, Y and Z variables by rotary knob. For @@@@@, Select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
@=@@@@@-#####	@=@@@@@-#####	Performs four operations between variables. For @. select one of I, J, K, S, X, Y and Z variables by rotary knob. For @@@@@, Select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
@=@@@@@*#####	@=@@@@@*#####	Performs four operations between variables. For @. select one of I, J, K, S, X, Y and Z variables by rotary knob. For @@@@@, Select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN ASELV and PWMTR variables by rotary knob.
@=@@@@@/#####	@=@@@@@/#####	Performs four operations between variables. For @. select one of I, J, K, S, X, Y and Z variables by rotary knob. For @@@@@, Select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.

Table 6-3 Special Command List (3/5)

Command list display	Program area display	Explanation and precaution of command (including parameter range)
PRINT'-----------'	PRINT'---------- 50 characters ---------'	Prints the command enclosed by single quotation marks. When a semicolon ";" is attached to the end of a comment, the comment (variable value) specified by the next PRINT command is printed in succession without line feed.
PRINT @@@@@	PRINT @@@@@	Prints the variable @@@@@ value with unit. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV, PWMTR, A$, FILE$ and TIME$ variables by rotary knob.
PRINT @@@@@;	PRINT @@@@@;	Prints the variable @@@@@ value with unit. After printing, the comment (variable value) specified by the next PRINT command is printed in succession without line feed. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN ASELV, PWMTR, A$, FILE$ and TIME$ variables by rotary knob.
PRINT DATA AREA	PRINT DATA AREA	Prints the contents of the data area.
IF F1<=@@@@@<=F2 GOTO	IF F1<=@@@@@<=F2 GOTO ***	***: (1 to 200, 1 step) When the variable @@@@@ value is more than F1 or less than F2, a jump takes place to the *** line. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
F1=********** ###	F1=********** ###	Substitutes a value for the variable F1. For **-**, real number of up to 10 digits including a sign and a decimal point can be set. For ###, select one of nm, THz, dB, dBm, pW, nW, μW, mW, W and '" (no unit) by rotary knob.

Table 6-3 Special Command List (4/5)

Command list display	Program area display	Explanation and precaution of command (including parameter range)
F2=********** ###	F2=********** ###	Substitutes a value for the variable F2. For **-**, a real number of up to 10 digits including a sign and a decimal point can be set. For ###, select one of nm, THz, dB, dBm, pW, nW, µW, mW, W and ' ' (no unit) by rotary knob.
F1=@@@@@	F1=@@@@@	Copies the contents of the variable @@@@@ to the variable F1. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
F2=@@@@@	F2=@@@@@	Copies the contents of the variable @@@@@ to the variable F2. For @@@@@, select one of I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, XCOL, YCOL, ZCOL, EDFNF, GAIN, ASELV and PWMTR variables by rotary knob.
@=LEVEL (****.*** nm)	@=LEVEL (****.*** nm)	Assigns the level of "****.***nm" wavelength points (obtained by active trace) into variable @. "@" can be I, J, K, S, X, Y or Z.
@=LEVEL (@@@@@)	@=LEVEL (@@@@@)	Assigns the level of "aaaa" variable wavelength points (obtained by active trace) into variable @. "aaaa" can be I, J, K, S, X, Y, Z, WM, W1, W2, PKWL, or DOMWL.
IF @@@@@<@@@@@ GOTO	IF @@@@@<@@@@@ GOTO ***	Jumps to line "***" if two variables satisfy the inequality sign condition.
IF @@@@@=<@@@@@ GOTO	IF @@@@@=<@@@@@ GOTO ***	Jumps to line "***" if two variables satisfy the inequality sign condition.
IF @@@@@=@@@@@ GOTO	IF @@@@@=@@@@@ GOTO ***	Jumps to line "***" if two variables satisfy the quality sign condition.
IF @@@@@<>@@@@@ GOTO	IF @@@@@<>@@@@@ GOTO ***	Jumps to line "***" if two variables satisfy the inequality sign condition. "@@@@@" can be I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, DOMWL, EDFNF, GAIN, ASELV, XCOL, YCOL, ZCOL, PWMTR, N, F1 or F2.
SEND **'-- ------'	SEND **'--------- 50 characters ----------'	**; (0 to 29, 1 step) Specifies the external unit of address **, connected to the [GP-IB 2] connector, as a listener and sends out the command in ' '. The delimiter is CR/LF.

Table 6-3 Special Command List (5/5)

Command list display	Program area display	Explanation and precaution of command (including parameter range)
SEND **'----------';@	SEND **'--------- 50 characters ----------';@	**: (0 to 29, 1 step) Specifies the external unit of address **, connected to the [GP-IB 2] connector, to the listener and sends out the variable @ value after the command in ''. The delimiter is CR/LF. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob.
SEND **'----';@;'----'	SEND **'-- 20 characters --';@;'-- 20 characters --'	**: (0 to 29, 1 step) Specifies external unit of address** being connected to [GP-IB2] connector as a listener and sends out the command in '', value of variable @ and command '' to the external unit, in that order. Delimiter is CR/LF. For @, one variable out of I, J, K, S, X, Y and Z is selected using the rotary knob.
RECEIVE **;A$	RECEIVE **;A$	**: (0 to 29, 1 step) Specifies the external unit of address**, connected to the [GP-IB 2] connector, as a talker, receives a message, and substitutes it for the character variable A$. Up to 512 characters can be received. The delimiter is CR/LF.
@=VAL(A$)	@=VAL(A$)	Converts the character variable A$ into a numeric value and substitutes it for the variable @. For @, select one of I, J, K, S, X, Y and Z variables by rotary knob.
@=VAL(A$, ***, ###)	@=VAL(A$, ***, ###)	***:(1 to 512, 1 step), ###:(1 to 512, 1 step) With the character variable A$, this command converts number of characters equivalent to ### starting from *** the character into numeric value and substitutes in to the variable @. For @, one variable out of I, J, K, S, X, Y or Z is selected using the rotary knob.
SPOLL **;S	SPOLL **;S	**:(0 to 29, 1 step) Performs serial polling to the external unit of address **, connected to the [GP-IB 2] connector, and substitutes the status byte for the variable S.
RESET OPTION	RESET OPTION	Performs remote clear, device clear and interface clear processing for the external unit connected to the [GP-IB 2] connector.
BEEP **	BEEP **	Activates the buzzer for ** × 100 msec. (1 to 10, 1 step)

6.7 Program Examples

Program examples are shown below.

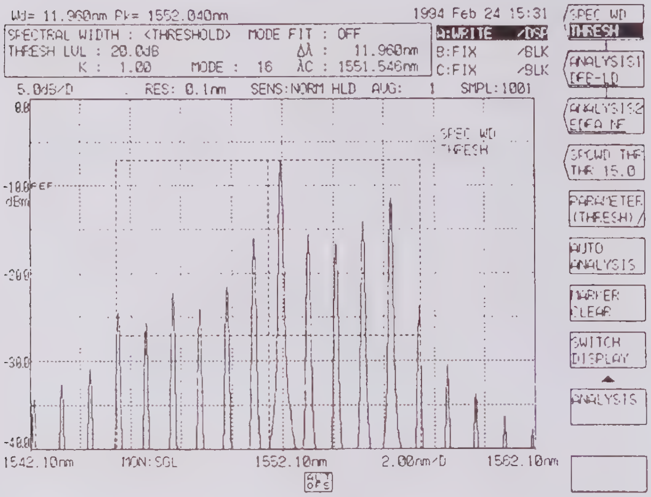
(1) After measuring conditions are set, a single sweep is executed.
Then, the spectral width and peak wavelength are searched and output to the label area and printer.
After waiting for 3 seconds, the above operation is repeated 10 times

```
001 CENTER WL 1552.10nm
002 SPAN 20.0nm
003 REFERENCE LEVEL -10.0dBm
004 RESOLUTION 0.1 nm
005 AVERAGE TIMES 1
006 SENS NORMAL RANGE HOLD
007 N=10
008 SINGLE
009 SPEC WD THRESH 20.0dB
010 PRINT Wd=;
011 LABEL Wd=;
012 PRINT SPWD;
013 LABEL SPWD;
014 PEAK SEARCH
015 PRINT Pk=;
016 LABEL Pk=;
017 PRINT PKWL
018 LABEL PKWL
019 WAIT 3S
020 N=N-1;IF N<>0 GOTO 8
021 END
```

[Explanation of program]

- Lines 001 to 006 .... Sets measuring conditions.
- Line 007 .... Sets 10 in loop counter N.
- Line 008 .... Executes a single sweep.
- Line 009 .... Makes a spectral width search.
- Lines 010 to 013 .... Outputs the spectral width to the printer and label area.
- Line 014 .... Makes a peak search.
- Lines 015 to 018 .... Outputs the peak wavelength value to the printer and label area.
- Line 019 .... Waits for 3 seconds.
- Line 020 .... Subtracts 1 from loop counter N. When the result is not 0, a jump takes place to line 008.
- Line 021 .... Terminates the program.

After execution of the above program, the following screen is output to the printer.



```
Wd= 11.960nm Pk= 1552.040nm                              1994 Feb 24 15:31
SPECTRAL WIDTH : <THRESHOLD>  MODE FIT : OFF          A:WRITE     /DSP
THRESH LVL : 20.0dB                  Δλ :    11.960nm  B:FIX       /BLK
         K :  1.00     MODE :  16    λC : 1551.546nm   C:FIX       /BLK
 5.0dB/D        RES: 0.1nm   SENS:NORM HLD  AVG:    1   SMPL:1001
1542.10nm      MON:SGL         1552.10nm      2.00nm/D      1562.10nm
```

```
Wd= 11.962nm Pk= 1552.060nm
Wd= 11.998nm Pk= 1552.040nm
Wd= 11.973nm Pk= 1552.040nm
Wd= 11.949nm Pk= 1552.040nm
Wd= 11.954nm Pk= 1552.060nm
Wd= 11.963nm Pk= 1552.060nm
Wd= 11.975nm Pk= 1552.060nm
Wd= 11.970nm Pk= 1552.040nm
Wd= 11.959nm Pk= 1552.040nm
Wd= 11.960nm Pk= 1552.040nm
```

(2) The waveforms stored in memories 0 to 31 are saved into the floppy disk and the file name list at that time is output to the printer.

```
001 N=32
002 Y=0
003 WRITE MEMORY Y
004 PRINT MEMORY ;
005 PRINT Y;
006 PRINT →
007 PRINT FILE$
008 Y=Y+1
009 N=N-1; IF N<>0 GOTO 3
010 END
```

[Explanation of program]

- Line 001 .... Sets 32 in loop counter N.
- Line 002 .... Substitutes 0 for variable Y.
- Line 003 .... The waveforms stored in the memory of the number of variable Y are saved into the floppy disk.
- Lines 004 to 007 .... Outputs the saving file name to the printer.
- Line 008 .... Adds 1 to variable Y.
- Line 009 .... Subtracts 1 from loop counter N.
  When the result is not 0, a jump takes place to line 003.
- Line 010 .... Terminates the program.

After execution of the above program, the following file name list is output to the printer.
If any of memories 0 to 31 stores no waveform, an error is displayed at that time and the program is terminated.

```
MEMORY  0.000000  →  W0000  .WAV
MEMORY  1.000000  →  W0001  .WAV
MEMORY  2.000000  →  W0002  .WAV
MEMORY  3.000000  →  W0003  .WAV
MEMORY  4.000000  →  W0004  .WAV
MEMORY  5.000000  →  W0005  .WAV
MEMORY  6.000000  →  W0006  .WAV
MEMORY  7.000000  →  W0007  .WAV
MEMORY  8.000000  →  W0008  .WAV
MEMORY  9.000000  →  W0009  .WAV
MEMORY  10.000000  →  W0010  .WAV
MEMORY  11.000000  →  W0011  .WAV
MEMORY  12.000000  →  W0012  .WAV
MEMORY  13.000000  →  W0013  .WAV
MEMORY  14.000000  →  W0014  .WAV
MEMORY  15.000000  →  W0015  .WAV
MEMORY  16.000000  →  W0016  .WAV
MEMORY  17.000000  →  W0017  .WAV
MEMORY  18.000000  →  W0018  .WAV
MEMORY  19.000000  →  W0019  .WAV
MEMORY  20.000000  →  W0020  .WAV
MEMORY  21.000000  →  W0021  .WAV
MEMORY  22.000000  →  W0022  .WAV
MEMORY  23.000000  →  W0023  .WAV
MEMORY  24.000000  →  W0024  .WAV
MEMORY  25.000000  →  W0025  .WAV
MEMORY  26.000000  →  W0026  .WAV
MEMORY  27.000000  →  W0027  .WAV
MEMORY  28.000000  →  W0028  .WAV
MEMORY  29.000000  →  W0029  .WAV
MEMORY  30.000000  →  W0030  .WAV
MEMORY  31.000000  →  W0031  .WAV
```

(3) The external unit connected to the [GP-IB 2] connector is specified as a listener and a device message is sent out. Next, it is specified as a talker and data is received.
Then, the data is output to the printer.
The above operation is repeated 10 times.

```
001 N=10
002 SEND 1 B, C1, E1, H1, S
003 WAIT IS
004 RECEIVE 1;A$
005 PRINT A$
006 N=N-1; IF N<>0 GOTO 2
007 END
```

[Explanation of program]

- Line 001 .... Sets 10 in loop counter N.
- Line 002 .... Specifies the external unit of address 1 as a listener and sends out the contents of '   '.
- Line 003 .... Waits for 1 second.
- Line 004 .... Specifies the external unit of address 1 as a talker, receives data, and substitutes it for character variable A$.
- Line 005 .... Outputs the contents of A$ to the printer.
- Line 006 .... Subtracts 1 from loop counter N. When the result is not 0, a jump takes place to line 002.
- Line 007 .... Terminates the program.

After execution of the above program, the data received from the external unit is output to the printer as follows.

```
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
XTB2E1-19.91
```

Chapter 7 FLOPPY DISK FUNCTIONS

This chapter describes floppy disk functions.

Contents of Chapter 7

7.1 Floppy Disk Functions 7-2

  7.1.1 Outline 7-2

  7.1.2 Loading/Unloading a floppy disk 7-3

7.2 Storing into a Floppy Disk 7-4

7.3 Reading from a Floppy Disk 7-10

7.4 File List Display 7-15

7.5 File Deletion 7-16

7.6 Floppy Disk Initialization 7-17

7.7 File Formats 7-19

  7.7.1 Waveforms files 7-19

  7.7.2 Data files 7-24

7.8 Data Compatibility with AQ-6312A/B Optical Spectrum Analyzer 7-28

7.1 Floppy Disk Functions

7.1.1 Outline

This equipment is provided with a floppy disk drive and can store the programs created by the program function, the waveforms displayed on this equipment and the waveforms stored in memory into a floppy disk and read them out from it.

These programs and waveforms are stored as MS-DOS format files on the disk. One waveform or program is stored as one file.

The waveforms of 3-dimensional display can be stored as a file in a lump.

The following table shows the types and sizes of the files to be stored in this equipment.

These files can coexist on the same disk.

Table 7-1 Types and Sizes of Files

Type	File name extension	File format	Size (in bytes)
Ordinary waveforms file	.WAV	Binary	5120
	.TXT	Text	20480
	.WAS	ASCII plus binary	20480
Program file	.PRG	Binary	14336
Data file	.DAT	ASCII	1024 (Note 1)
Graphic file	.BMP	Binary	156672 (Note 2)
	.TIF	Binary	156672 (Note 2)
Setup info file	.SET	Binary	1024
3D waveforms file	.3D	Binary	72704

*1 *If data is added to an existing file repeatedly, the file size is increased gradually.*

*2 *Indicates the file size if graphic file in the color mode is stored. If the file in monochrome mode is stored, its size is reduced to 38912 bytes.*

The storage capacity of one floppy disk is shown below.

Table 7-2 Floppy Disk Capacity

Initialization type	Capacity (bytes)	Maximum number of files
1.2 Mbyte	1250304	191
1.44 Mbyte	1455616	223

Because this equipment uses only the root directory, the number of files that can be stored in one disk is equal to the maximum number of files that can be stored in the root directory. Table 7-2 shows the maximum number of files.

(It indicates the number of files when the files whose extensions are ".WAV", ".DAT" and ".SET" are saved.)

The files having the extensions of ".WAS", ".PRG", ".3D", ".BMP" and ".TIF" are relatively large in their size. Therefore, the number of these files may be limited when saved on a floppy disk.

7.1.2 Loading/Unloading a floppy disk

Figure 7-1 shows an external view of the floppy disk and the floppy disk drive. After checking the direction of the floppy disk, insert it from the insertion port.
To pull it out, push the eject button shown in the figure.

CAUTION

- *Before loading/unloading a floppy disk, be sure to check that the access lamp of the drive is OFF. If the disk is pulled out in the lamp ON status, the contents stored in the disk may be destroyed.*
- *When the write inhibit notch is set to the write inhibit side, data store or file delete processing is impossible.*

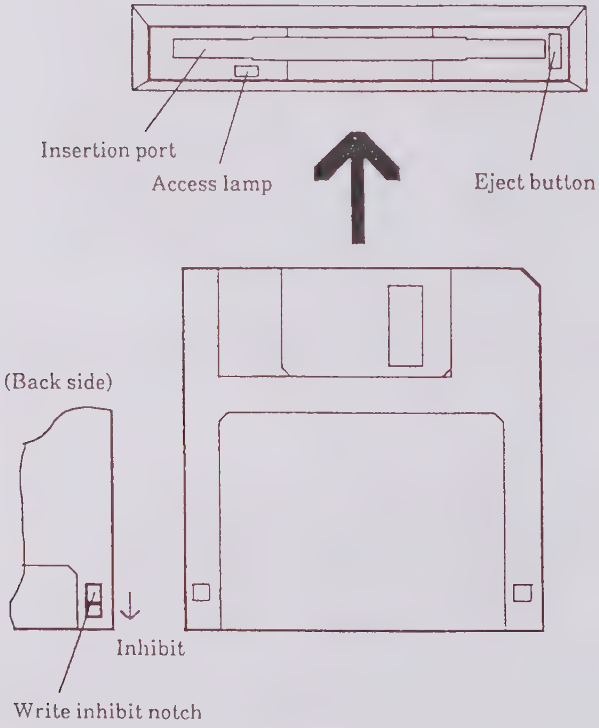


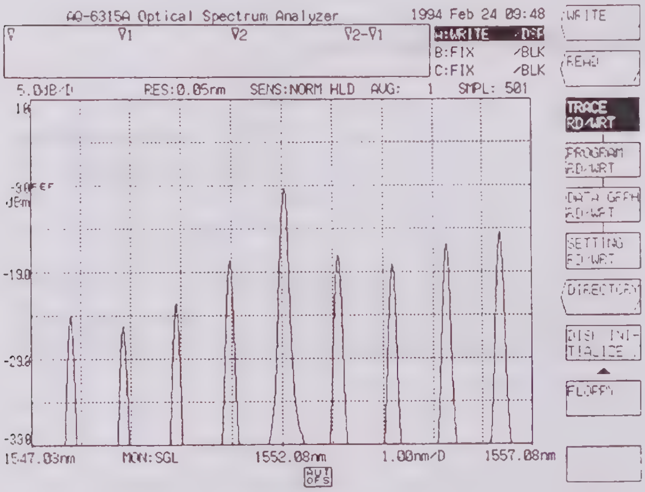
Fig. 7-1 Floppy Disk and Drive

7.2 Storing into a Floppy Disk

To store the programs created by the program function, the waveforms displayed on the screen or waveforms in memory (MEM0 to MEM31) into a disk, observe the following procedure.

(1) Press the [FLOPPY] switch.

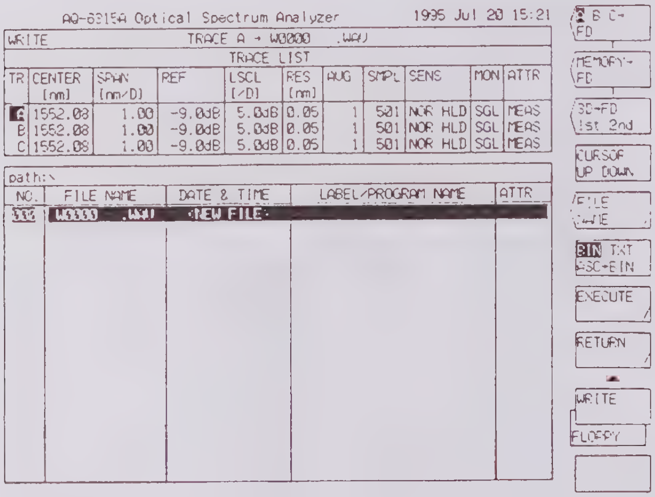
(2) The soft key menu changes as follows.
- To store waveforms, press the <TRACE RD/WRT> key.
  (The 3 store types of binary, TEXT and ASCII are available.)
- To store data (date/time, label, contents of data area, setting conditions), press the <DATA GRAPH RD/WRT> key to highlight the 'DATA' section.
- To save the on-screen waveforms data (graphics) as they are, press the <DATA GRPH RD/WRT> key to highlight the 'GRPH' section.
- To store programs, press the <PROGRAM/WRT> key.
- To store setup information (parameter information and select status of all soft keys, user key registration information), press the <SETTING RD/WRT> key.



(3) By pressing the <WRITE> key, the screen for storage is displayed according to the soft key selected in (2).
- For waveform storage, select the type of storage source.
  When the <ABC → FD> key is selected, press this key once again and move the cursor to the type of the trace to be stored.
  When the <MEMORY → FD> key is selected, move the cursor to the waveform to be stored by the rotary knob or step keys and press the <CURSOR UP DOWN> key.
  Select the store type among BINARY, TEXT and ASCII by the <BIN TXT BIN+ASC> key.
  For details of these formats, see Section 7.7.

- For program storage, move the cursor to the program to be stored by the rotary knob or step keys and press the <CURSOR UP DOWN> key.
- For data storage, select the contents to be stored by a soft key. For data/system information storage, the data of system information at the time when the [FLOPPY] switch was pressed is stored. It is not necessary to specify the file of storage source.
  Before data storage, select the storage data using soft keys.
- When the <RETURN> key is pressed, the screen of (2) is displayed again.

- Screen for Waveform Storage
(When <ABC → FD> is selected)



AQ-6315A Optical Spectrum Analyzer 1995 Jul 20 15:21

WRITE TRACE A → W0000 .WAV

TRACE LIST

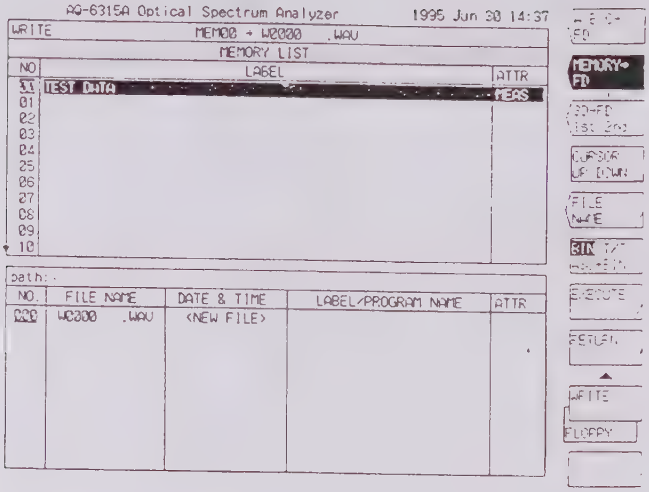
TR	CENTER [nm]	SPAN [nm/D]	REF	LSCL [/D]	RES [nm]	AVG	SMPL	SENS	MON	ATTR
A	1552.08	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
B	1552.08	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
C	1552.08	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	W0000 .WAV	<NEW FILE>		

TR	Type of trace	NO.	File number
CENTER	Mean wavelength	FILE NAME	List of stored files
SPAN	Span (sweep width)	DATE & TIME	Storage date and time of each file
REF	Reference level	LABEL/PROGRAM NAME	
LSCL	Level axis scale		Label and program name stored in each file.
RES	Resolution		
AVG	Number of averaging times	ATTR	Type of the waveforms stored in each memory. Number of waveform types : 13 (Refer to Table 5-1.)
SMPL	Sampling count		
SENS	Measuring sensitivity		
MON	Monochromator status		

- Screen for Waveform Storage
(When <MEMORY → FD> is selected)


AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 14:37

WRITE MEM00 → W0000 .WAV

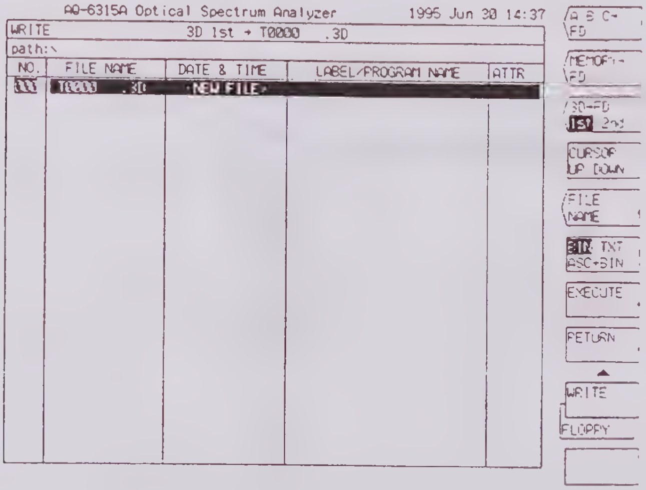
MEMORY LIST

NO	LABEL	ATTR
00	TEST DATA	MEAS
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	W0000 .WAV	<NEW FILE>		

- Screen for Waveform Storage
(When <3D → FD 1st 2nd> is selected)

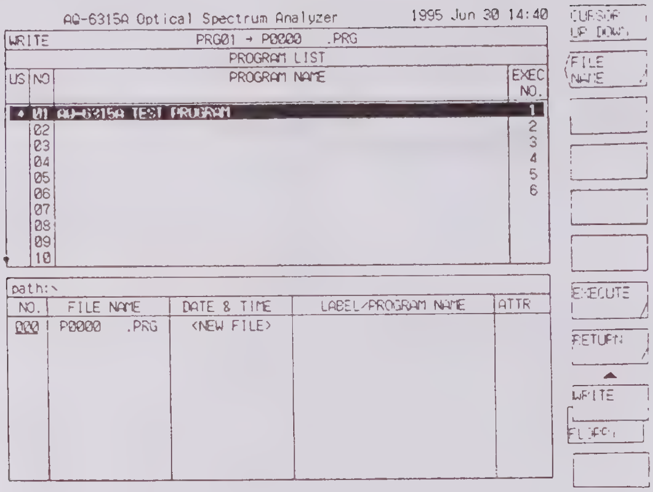

AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 14:37

WRITE 3D 1st → T0000 .3D

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	T0000 .3D	<NEW FILE>		

- **Screen for Program Storage**


AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 14:40

WRITE PRG01 → P0000 .PRG

PROGRAM LIST

US	NO	PROGRAM NAME	EXEC NO.
*	01	AQ-6315A TEST PROGRAM	1
	02		2
	03		3
	04		4
	05		5
	06		6
	07		
	08		
	09		
	10		

path:\

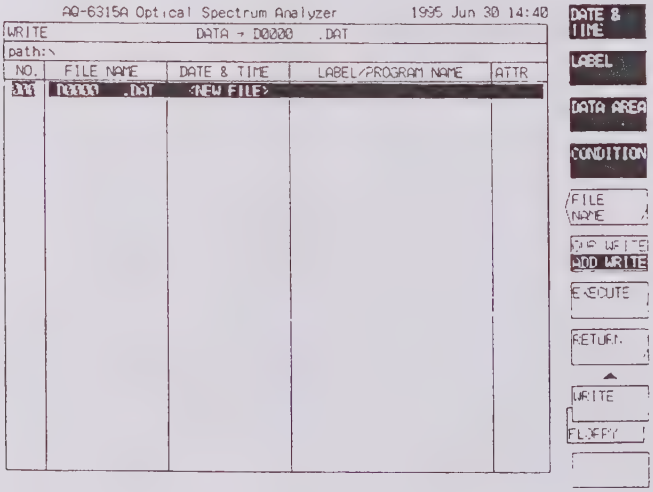
NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	P0000 .PRG	<NEW FILE>		

US : The mark * is displayed at the number storing a program.

EXEC NO. : Number registered in the program execute key (<EXEC1 (**)> to <EXEC6 (**)>).

** : Program No.

- **Screen for Data Storage**

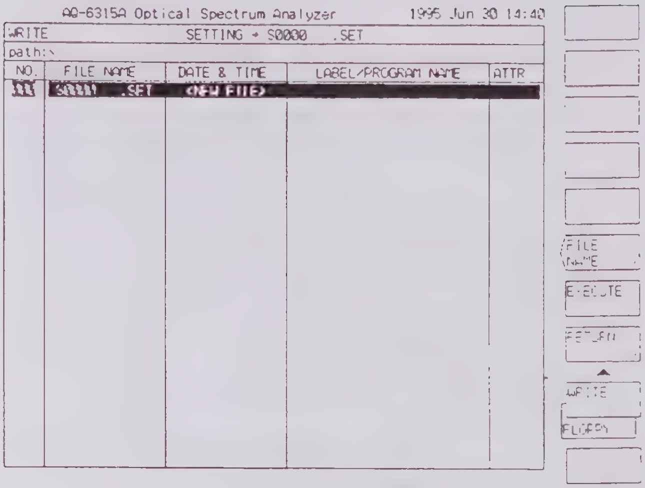

AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 14:40

WRITE DATA → D0000 .DAT

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	D0000 .DAT	<NEW FILE>		

- Screen for Setup Information Storage



NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
[illegible]	S0000 .SET	<NEW FILE>		

- To create a new file and store it, move the cursor to the file name displayed as <NEW FILE> at the top.
  The new file name is first "W0000. WAV", "W0000. TXT" or "W0000. WAS" (waveform), "P0000. PRG" (program), "D0000. DAT" (data), "G0000.BMP" or "G0000TIF" (graphics), "S0000. SET" (setup information), or "T0000. 3D" (3-dimensional waveform).
  (The numeric portion in the file name is automatically given so as to avoid duplication with other files.)
  To change a file name, press the <FILE NAME> key. Then, the window for character input and the soft key menu appear in the same way as label input. Enter the file name in the same way as label input and press the <DONE> key.
- To change the contents of an existing file without creating a new file, move the cursor to this target file by the rotary knob or step keys.

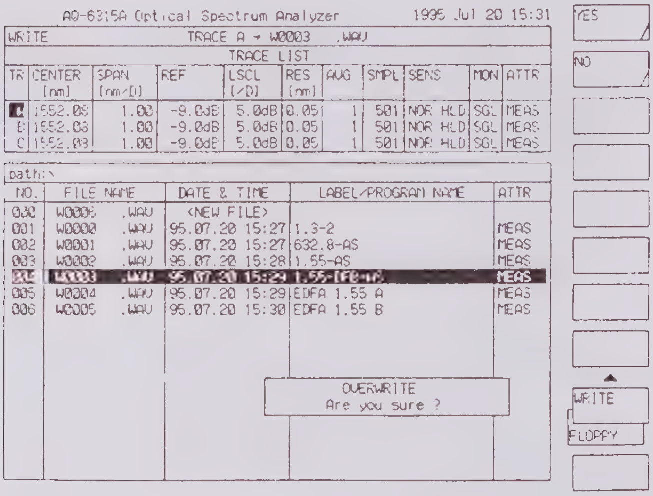
CAUTION

To change a file name, use the characters usable for file names in MS-DOS.
They are as shown below. (8 characters max.)

```
!#$%&' ()-
0123456789a
ABCDEFGHIJKLMNOPQRSTUVWXYZ^_
abcdefghijklmnopqrstuvwxyz{}
```

(4) Check that the "WRITE TRACE A → W0000. WAV" in the upper part of the screen has been changed into "Waveform/program/data/system information to be stored" → "File name".

- When the <EXECUTE> key is pressed, store processing is executed to the disk.
- When the <RETURN> key is pressed, the screen of (2) is displayed again without executing store processing.
  If an existing file is selected in (3), the following display appears on the screen before execution of store processing.
  To execute store processing, press the <YES> key. To cancel it, press the <NO> key.



AQ-6315A Optical Spectrum Analyzer 1995 Jul 20 15:31

WRITE TRACE A → W0003 .WAV

TRACE LIST

TR	CENTER [nm]	SPAN [nm/D]	REF	LSCL [/D]	RES [nm]	AVG	SMPL	SENS	MON	ATTR
A	1552.08	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
B	1552.03	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
C	1552.03	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	W0006 .WAV	<NEW FILE>		
001	W0000 .WAV	95.07.20 15:27	1.3-2	MEAS
002	W0001 .WAV	95.07.20 15:27	632.8-AS	MEAS
003	W0002 .WAV	95.07.20 15:28	1.55-AS	MEAS
004	W0003 .WAV	95.07.20 15:29	1.55-DFB-LD	MEAS
005	W0004 .WAV	95.07.20 15:29	EDFA 1.55 A	MEAS
006	W0005 .WAV	95.07.20 15:30	EDFA 1.55 B	MEAS

OVERWRITE
Are you sure ?

(5) After completion of store processing, the store screen is displayed continuously. After completion of store processing of setup information file, however, the waveform display returns to the screen of (2).

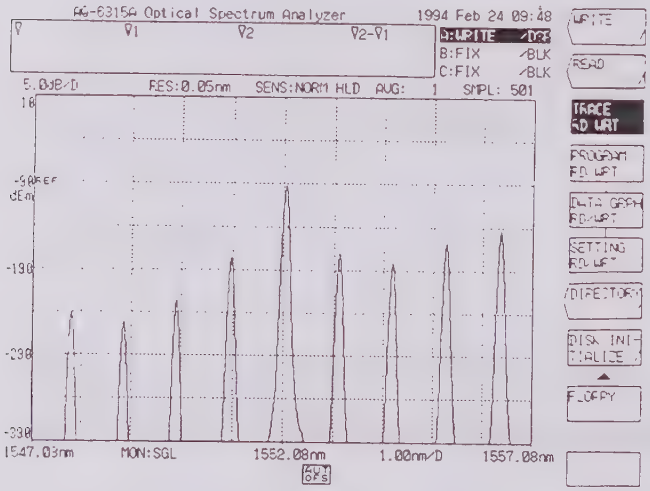
7.3 Reading from a Floppy Disk

To read out the programs or waveforms etc. stored in a disk, observe the following procedure.

(1) Press the [FLOPPY] switch.

(2) The soft key menu changes as follows.

- To read a waveform, press the <TRACE RD/WRT> key.
- To read out a program, press the <PROGRAM RD/WRT> key.
- To read out data (date/time, label, contents of data area, setting conditions), press the <DATA GRAPH RD/WRT> key to highlight the data section.
- To read out setup information (parameter information and select status of all soft keys, user key registration information), press the <SETTING RD/WRT> key.


AQ-6315A Optical Spectrum Analyzer 1994 Feb 24 09:48

A:WRITE /DSP
B:FIX /BLK
C:FIX /BLK

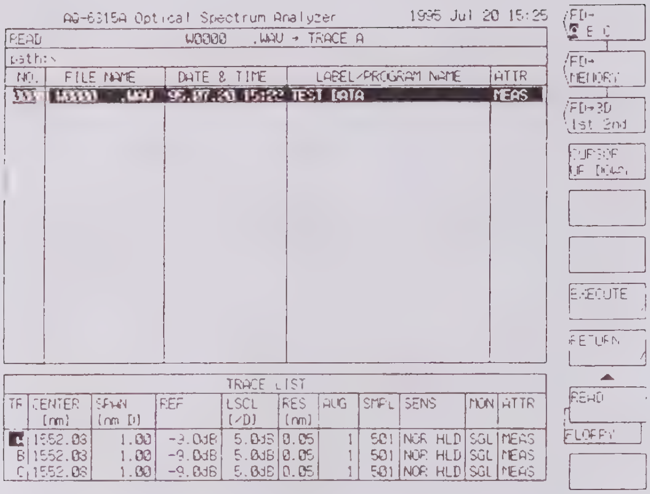
5.0dB/D RES:0.05nm SENS:NORM HLD AVG: 1 SMPL: 501

1547.03nm MON:SGL 1552.08nm 1.00nm/D 1557.08nm

(3) When the <READ> key is pressed, the screen for reading is displayed according to the soft key selected in (2).
The function of each soft key is the same as that for storage.

- Move the cursor to the file name to be read out by the rotary knob or step keys. To read out a program or waveform, press the <CURSOR UP DOWN> key after that.
- When the <RETURN> key is pressed, the screen of (2) is displayed again.

- Screen for Waveform Reading
(When <FD → ABC> is selected)



AQ-6315A Optical Spectrum Analyzer 1995 Jul 20 15:25

READ W0000 .WAV → TRACE A

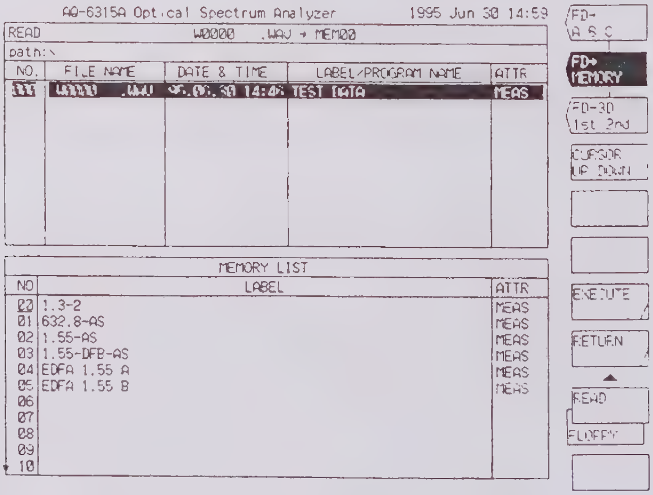
path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
[illegible]	W0000 .WAV	95.07.20 15:22	TEST DATA	MEAS

TRACE LIST

TR	CENTER (nm)	SPAN (nm D)	REF	LSCL (/D)	RES (nm)	AVG	SMPL	SENS	MON	ATTR
A	1552.03	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
B	1552.03	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS
C	1552.03	1.00	-9.0dB	5.0dB	0.05	1	501	NOR HLD	SGL	MEAS

- Screen for Waveform Reading
(When <FD → MEMORY> is selected)



AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 14:59

READ W0000 .WAV → MEM00

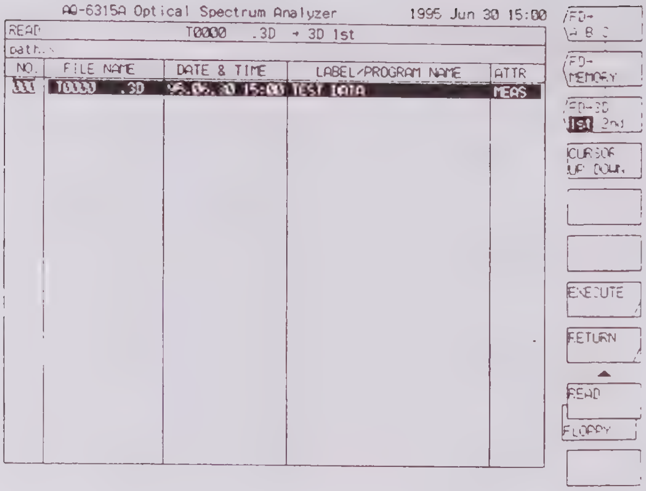
path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
[illegible]	W0000 .WAV	95.06.30 14:46	TEST DATA	MEAS

MEMORY LIST

NO	LABEL	ATTR
00	1.3-2	MEAS
01	632.8-AS	MEAS
02	1.55-AS	MEAS
03	1.55-DFB-AS	MEAS
04	EDFA 1.55 A	MEAS
05	EDFA 1.55 B	MEAS
06		
07		
08		
09		
10		

- Screen for Waveform Reading
(When <FD → 3D 1st 2nd> is selected)



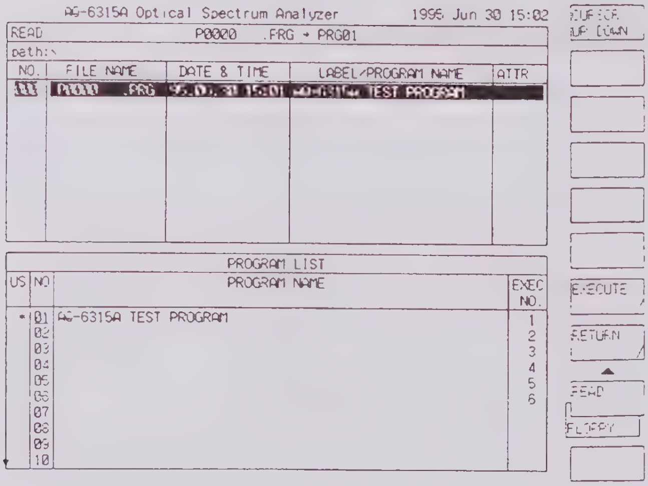
AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 15:00

READ T0000 .3D → 3D 1st

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
001	T0000 .3D	95.06.30 15:00	TEST DATA	MEAS

- Screen for Program Reading



AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 15:02

READ P0000 .PRG → PRG01

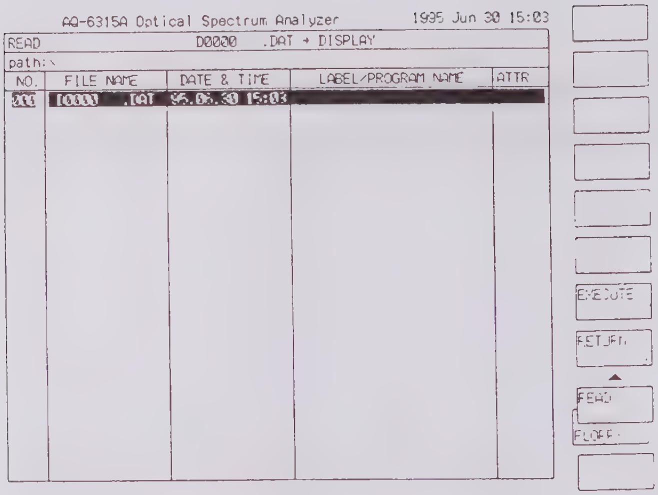
path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
001	P0000 .PRG	95.06.30 15:01	AQ-6315A TEST PROGRAM	

PROGRAM LIST

US	NO	PROGRAM NAME	EXEC NO.
*	01	AQ-6315A TEST PROGRAM	1
	02		2
	03		3
	04		4
	05		5
	06		6
	07		
	08		
	09		
	10		

- Screen for Data Reading

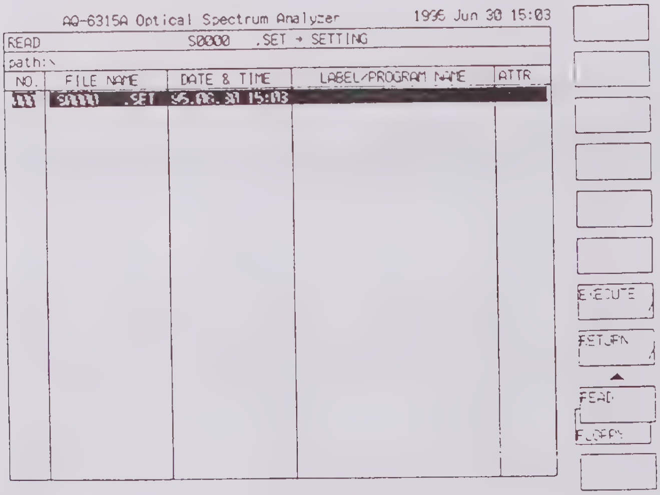

AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 15:03

READ D0000 .DAT → DISPLAY

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	D0000 .DAT	95.06.30 15:03		

- Screen for Setup Information Reading


AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 15:03

READ S0000 .SET → SETTING

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	S0000 .SET	95.06.30 15:03		

- To read out a waveform, select the type of a read source.
  When the <FD → ABC> key is selected, press it once again and move the cursor to the type of trace of the read source.
  When the <FD → MEMORY> key is selected, move the cursor to the memory of the read source by the rotary knob or step keys.
- To read out a program, move the cursor to the memory of the read source by the rotary knob or step keys.
  To read out data or system information, it is not necessary to specify a read source.

(4) Check that the "READ W0000 → TRACE A" display in the upper part of the screen has been changed into "File name to be read" → "Read source".

- When the <EXECUTE> key is pressed, read processing is executed for the disk.
- When the <RETURN> key is pressed, the screen of (2) is displayed again without read processing.

(5) After completion of the read processing, the screen of (2) or (3) is displayed again.

- In general, when a waveform has been read out (<FD→ABC> is selected) and when a program has been read out, the read screen (3) is displayed continuously. After completion of the read processing of setup information file,, however, the display returns to the waveform screen (2).
- When data has been read out, the screen changes into "DATA DISPLAY AREA" and the data is displayed. When the soft key <DONE> is pressed, the screen of (3) is displayed again.

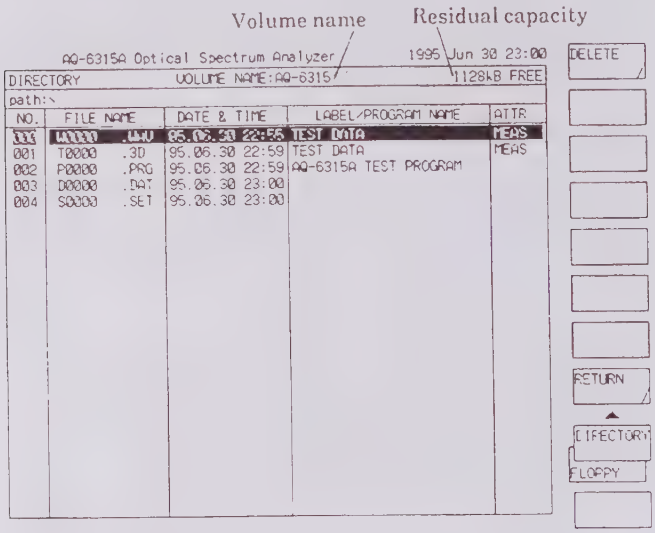
NOTE

When 3-dimensional waveforms have been read out, the read waveforms are stored into memory 0 to 15 (1st) or 16 to 31 (2nd) (selected by the soft key <FD → 3D 1st 2nd>).

7.4 File List Display

When the <DIRECTORY> key is pressed, a list of files stored in the disk can be seen.

- Press the [FLOPPY] switch and then the <DIRECTORY> key, and the following screen appears.



AQ-6315A Optical Spectrum Analyzer 1995 Jun 30 23:00

DIRECTORY VOLUME NAME:AQ-6315 1128kB FREE

path:\

NO.	FILE NAME	DATE & TIME	LABEL/PROGRAM NAME	ATTR
000	W0000 .WAV	95.06.30 22:56	TEST DATA	MEAS
001	T0000 .3D	95.06.30 22:59	TEST DATA	MEAS
002	P0000 .PRG	95.06.30 22:59	AQ-6315A TEST PROGRAM	
003	D0000 .DAT	95.06.30 23:00		
004	S0000 .SET	95.06.30 23:00		

Top of screen	Displays the volume name given to the disk, and the residual capacity.
NO.	Displays the file number.
FILE NAME	Displays a list of files stored in the disk.
DATE & TIME	Displays the date and time of each file storage.
LABEL/PROGRAM NAME	Display the program name and label stored in each file.
ATTR	Displays the types of waveforms stored in each file.
<DELETE> key	Deletes files in the disk.
<RETURN> key	Returns to the screen displayed by pressing the [FLOPPY] switch after terminating the list display.

NOTE

Files other than those stored in this equipment are displayed.
However, only the files existing in the root directory are displayed and the following files are not displayed.

- *Secret attribute file*
- *System file attribute file*

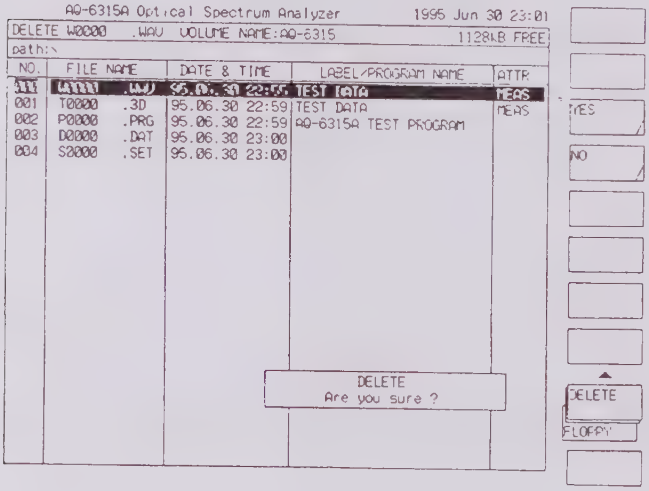
7.5 File Deletion

To delete files in the disk, observe the following procedure.

(1) Press the <DIRECTORY> key to display a list of files in the same way as 7.4 File List Display.

(2) Move the cursor to a file name to be deleted by the rotary knob or step keys.

(3) After completion of file name selection, check that the file name displayed in the upper part of the screen has been changed into the file name to be deleted and then press the <DELETE> key. The following is displayed.



```
        AQ-6315A Optical Spectrum Analyzer          1995 Jun 30 23:01
DELETE W0000   .WAU  VOLUME NAME:AQ-6315                1128kB FREE
path:\
 NO. | FILE NAME    | DATE & TIME    |  LABEL/PROGRAM NAME       |ATTR
 000 | W0000   .WAV | 95.06.30 22:55 |TEST DATA                  |MEAS
 001 | T0000   .3D  | 95.06.30 22:59 |TEST DATA                  |MEAS
 002 | P0000   .PRG | 95.06.30 22:59 |AQ-6315A TEST PROGRAM      |
 003 | D0000   .DAT | 95.06.30 23:00 |                           |
 004 | S2000   .SET | 95.06.30 23:00 |                           |

                                  DELETE
                               Are you sure ?
```

- When the <YES> key is pressed, delete processing is executed.
- To cancel it, press the <NO> key.

(4) After completion of delete processing, the screen of (1) is displayed again.
- To delete another file, repeat steps (2) and (3).

NOTE

Files other than those stored in this equipment can be deleted.
However, only the files existing in the root directory can be deleted and the following files cannot be deleted (not displayed)

- *READ ONLY attribute file*
- *Secret attribute file*
- *System file attribute file*
- *Subdirectory*

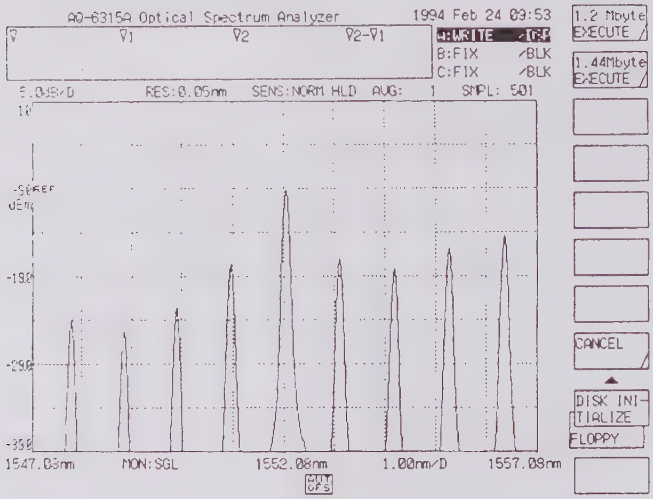
7.6 Floppy Disk Initialization

Before using a new disk, it must be initialized. For disk initialization, observe the following procedure.

(1) Press the [FLOPPY] switch and then the <DISK INITIALIZE> key.

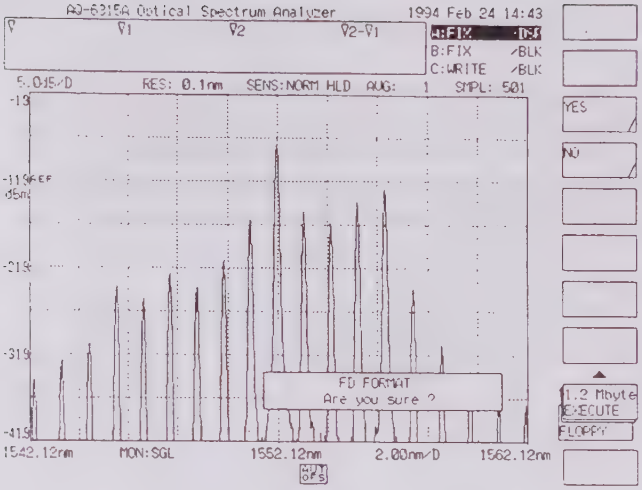
(2) The following display appears.

- When the <1.2 Mbyte EXECUTE> key is pressed, disk initialize execution is set to 1.2M bytes.
- When the <1.44 Mbyte EXECUTE> key is pressed, disk initialize execution is set to 1.44M bytes.



(3) When any soft key is pressed in (2), the following display appears.

- When the <YES> key is pressed, disk initialize processing is executed. (To stop it, press the <STOP> key.)
- When the <NO> key is pressed, the screen displayed by pressing the [FLOPPY] switch is displayed again without executing initialize processing.



```
AQ-6315A Optical Spectrum Analyzer          1994 Feb 24 14:43
B:FIX     /BLK
C:WRITE   /BLK
5.0dB/D     RES: 0.1nm   SENS:NORM HLD   AVG:   1   SMPL: 501
FD FORMAT
Are you sure ?
1542.12nm   MON:SGL   1552.12nm   2.00nm/D   1562.12nm
```

(4) After completion of the initialize processing, the screen displayed by pressing the [FLOPPY] switch is displayed again.

NOTE

To a disk initialized in this equipment, the volume name "AQ-6315" is given.

CAUTION

- *The floppy disks that are usable in this equipment are only of 3.5-inch 2HD.*
- *By executing initialize processing, all the information recorded in the disk is lost.*

7.7 File Formats

7.7.1 Waveforms files

- When the trace waveforms are saved on a floppy disk, the data is saved in the internal format if the "BIN" format is selected by the <BIN TXT BIN+ASC> key.
- If the "TXT" format is selected by this key, the measured data is saved in the text format.
  If the data is saved in the text format, the file size is increased. However, the files in this format are very easy to be processed by the tabulation calculation software and others on the PC during data analysis.
- If the "BIN+ASC" combination format is selected, the measured data is saved as the text data and the binary data. The files in this format can be read by the AQ-6315A/B Analyzer having the previous system software (revision 04.xx or before). However, part of this information may be lost.
  (The text data format differs from the explanation given below).

The following gives a data writing examples of trace waveforms in the "TXT" format.
Also, the standard data format is given.

Data writing example of trace waveforms in text format:

```
LATXT
600nm LED                                   Header information
00
 560.000, -92.446
 560.200, -92.347
 560.400, -92.531
 560.600, -92.220
 560.800, -92.582
 561.000, -91.993                           Waveforms data of 1001 points
 561.200, -92.308                           (wavelength and level value)
       :
       :
       :
 759.600, -92.211
 759.800, -92.804
 760.000, -92.446
"CTRWL", 660.00
"SPAN", 200.0
"REFL", -40.0
"LSCL",10.0
"RESLN",10.00
"AVG",   1
"SMPL",1001                                 Measuring conditions
"HIGH 3"                                    (during measurement)
"NMSK","OFF"
"LBL","660nm LED
"MONO SGL"
"MEAS"
"LSUNT",1
"CTRWL", 660.00
"SPAN", 200.0
"REFL", -40.0
"LSCL",10.0
"RESLN",10.00
"AVG",  1                                   Measuring conditions
"SMPL",1001                                 (during saving)
"HIGH 3"
"NMSK","OFF"
"LBL","660nm LED
"MONO SGL"
"MEAS"
"LSUNT",1
```

(1) Header information

LATXT(CR)(LF)	[File type]
....(CR)(LF)	[Label description (up to 50 characters)]
**(CR)(LF)	[Waveforms type]

The waveforms types can be classified into the following groups:

No.	Waveforms type	No.	Waveforms type	No.	Waveforms type	No.	Waveforms type
00	WRITE	04	ROLL AVERAGE	08	B-A (LIN)	12	CURVE FIT
01	—	05	A–B (A/B)	09	A+B (LIN)	13	PEAK CURVE FIT
02	MAX HOLD	06	B–A (B/A)	10	NORMALIZE		
03	MIN HOLD	07	A–B (LIN)	11	DOMINANT		

(2) Waveforms data

****.***, ±***.***(CR)(LF)	[Wavelength and level at first point]
****.***, ±***.***(CR)(LF)	[Wavelength and level at second point]
:	
****.***, ±***.***(CR)(LF)	[Wavelength and level at 1001-th point]

Similar to the "Wavelength (20h space) Level", the waveforms data sets at the first to 1001-th points are separated from each other by a combination of CR (0Dh) and LF (0Ah) codes.

Wavelength format: .... ****.***
Level format............................ ±***.*** (LOG scale)
*.***E±** (LIN scale)

(3) Measuring conditions

①	"CTRWL",****.**(CR)(LF)	[Center wavelength]
②	"SPAN",***.*(CR)(LF)	[Span]
③	"REFL",-**.*(CR)(LF)	[Reference (REF) level]
④	"LSCL",**.*(CR)(LF)	[Main level scale]
⑤	"RESLN",**.**(CR)(LF)	[Resolution]
⑥	"AVG",****(CR)(LF)	[Averaging count]
⑦	"SMPL",****(CR)(LF)	[Sampling count]
⑧	"HIGH 3"(CR)(LF)	[Measurement sensitivity]
⑨	"NMSK",-**(CR)(LF)	[Noise mask value]
⑩	"LBL","***-***."(CR)(LF)	[Label description]
⑪	"MONO SGLorDBL"(CR)(LF)	[Monochrome setup (SGL for single, DBL for double)]
⑫	"MEAS"(CR)(LF)	[Waveforms type]
⑬	"LSUNT",*	[Switching of display unit (0 for "dBm*", 1 for "dBm/nm*")]

For the data formats of levels given in paragraphs ③ and ④, one of the following data is output depending on the level scale indication:

- **Main level scale**

LOG mode:

"REFL",-**.*(CR)(LF)	[Reference (REF) level]
"LSCL",**.*(CR)(LF)	[Main level scale]

LIN mode:

"REFL",-**.*(CR)(LF)	[Reference (REF) level]
"LSCL",**.*(CR)(LF)	[Main level scale]
"BASEL",****.**(CR)(LF)	[Main base level]

- **Sublevel scale**

LOG mode:

"REFL",-**.*(CR)(LF)	[Sub-reference level]
"SSCLG",**.*(CR)(LF)	[Sub-level scale]
"LOFST",**.*(CR)(LF)	[Sub-offset level]

LIN mode:

"REFL",-**.*(CR)(LF)	[Sub-reference level]
"SSCLN",*.****(CR)(LF)	[Sub-level scale]
"SMIN",**.**(CR)(LF)	[Sub-base level]

dB/km mode:

"REFL",-**.*(CR)(LF)	[Sub-reference level]
"SSKM",**.*(CR)(LF)	[Sub-level scale]
"OFSKM",***.*(CR)(LF)	[Sub-offset level]
"LENG",**.***(CR)(LF)	[Optical fiber length]

% mode:

"REEFL",-**.*(CR)(LF)	[Sub-reference level]
"SSPS",***.*(CR)(LF)	[Sub-level scale]
"SMINP",***.*(CR)(LF)	[Sub-base level]

For the measurement sensitivity format given in paragraph ⑧, one of the following data is output depending on the measurement sensitivity type:

"PLSLPF"(CR)(LF)	[LPF mode]
"PLSPKH",****(CR)(LF)	[Peak Hold mode]
"PLSEXT"(CR)(LF)	[External Trigger mode]
"HIGH 1"(CR)(LF)	[HIGH SENS 1]
"HIGH 2"(CR)(LF)	[HIGH SENS 2]
"HIGH 3"(CR)(LF)	[HIGH SENS 3]
"NR_HLD"(CR)(LF)	[NORMAL RANGE HOLD]
"NR_AT"(CR)(LF)	[NORMAL RANGE AUTO]

For the waveforms type format given in paragraph ⑫, one of the following data is output depending on the waveforms type:

"MEAS"(CR)(LF)	[Write mode]
"MAXH"(CR)(LF)	[Max Value Detect mode]
"MINH"(CR)(LF)	[Min Value Detect mode]
"RAVG",***(CR)(LF)	[Sequential Addition mode]
"A-B"(CR)(LF)	[Subtract A by B mode (LOG)]
"B-A"(CR)(LF)	[Subtract B by A mode (LOG)]
"A-BL"(CR)(LF)	[Subtract A by B mode (LIN)]
"B-AL"(CR)(LF)	[Subtract B by A mode (LIN)]
"A+BL"(CR)(LF)	[Add A by B mode (LIN)]
"NORM"(CR)(LF)	[Normalizing waveforms display mode]
"DOMI"(CR)(LF)	[Visual sensitivity compensation waveforms display mode]
"CVFT",**(CR)(LF)	[Curve fit display mode]
"CVFTPK",**(CR)(LF)	[Peak curve fit display mode]

CAUTION

The "BIN+ASC" format files can be read by the AQ-6315A/B Analyzer having the previous system software (revision 04.xx or before).

However, part of the waveforms and measuring conditions information may be lost if the files are saved in the TXT or BIN+ASC format.

7.7.2 Data files

The data files are saved on a floppy disk in the ASCII format if the <DATE&TIME>, <LABEL>, <DATA AREA>, or <CONDITION> software key is selected.

The data not selected is written without any space.

The following gives a data file storage example and defines its format.

Data file writing example:

```
"LADAT                                                        ....... Header information
"1994 May 06 09:51"                                           ...... Date and time
"AQ-4139(155) LD UNIT                                         ....... Label description
"<FP-LD ANALYSIS> MODE :   9 SPEC WD :  3.854nm"           ┐
"MEAN WL : 1552.908nm    TOTAL POWER : -3.53dBm"           ├── Data area contents
"  PK WL : 1552.000nm        PK LVL  : -8.04dBm"           ┘
"CTRWL 1552.00"                                            ┐
"SPAN  10.0"                                               │
"REFL -16.0"                                               │
"LSCL   5.0"                                               ├── Measuring conditions
"RESLN  0.1"                                               │
"AVG      1"                                               │
"SMPL   501"                                               │
"NR_AT "                                                   │
"NMSK OFF"                                                 │
"MONO:SGL"                                                 │
"MEAS"                                                     ┘
```

Data file format

The following gives an example of data file format. The header information is saved on a floppy disk first, then the selected data is saved on the disk.
When an additional data is saved, the data other than the header information is written on the disk. The following details the data format.

(1) Header information
"LADAT"(CR)(LF) [File type]

(2) When <DATE&TIME> key is pressed:
"YYYY MMM DD HH:MM"(CR)(LF) [Date and time (year, month, day, and hours)]

(3) When <LABEL> key is pressed:
"LABEL DATA 50 CHARACTERS"(CR)(LF) [Up to 50 label characters]

(4) When <DATA AREA> key is pressed:

```
"<FP-LD ANALYSIS> MODE :9              SPEC WD   :    3.854nm"(CR)(LF)
"MEAN WL    :  1552.908nm          TOTAL POWER   :   -3.53dBm"(CR)(LF)
"PK WL      :  1552.000nm               PK LVL   :   -8.04dBm"(CR)(LF)
```

The data area contents are written as they are. When the WDM analysis function is executed, the WDM list is written.

(5) When the <CONDITION> key is pressed:

①	"CTRWL****.**"(CR)(LF)	[Center wavelength]
②	"SPAN****.*"(CR)(LF)	[Span]
③	"REFL-**.*"(CR)(LF)	[Reference (REF) level]
④	"LSCL**.*"(CR)(LF)	[Main level scale]
⑤	"RESLN**.**"(CR)(LF)	[Resolution]
⑥	"AVG****"(CR)(LF)	[Averaging count]
⑦	"SMPL****"(CR)(LF)	[Sampling count]
⑧	"HIGH 3'"(CR)(LF)	[Measurement sensitivity]
⑨	"NMSK-**"(CR)(LF)	[Noise mask value]
⑩	"MONO:SGLorDBL"(CR)(LF)	[Monochrome setup (SGL for single, DBL for double)]
⑪	"MEAS"(CR)(LF)	[Waveforms type]
⑫	"LSUNT*"	[Switching of display unit (0 for "dbm*", 1 for "dBm/nm*")]

For the data formats of levels given in paragraphs ③ and ④, one of the following data is output depending on the level scale indication:

- **Main level scale**

LOG mode:

"REFL"-**.*(CR)(LF)	[Reference (REF) level]
"LSCL"**.*(CR)(LF)	[Main level scale]

LIN mode:

"REFL"-**.*(CR)(LF)	[Reference (REF) level]
"LSCL"**.*(CR)(LF)	[Main level scale]
"BASEL"****.**(CR)(LF)	[Main base level]

- **Sublevel scale**

LOG mode:

"REFL"-**.*(CR)(LF)	[Sub-reference level]
"SSCLG"**.*(CR)(LF)	[Sub-level scale]
"LOFST"**.*(CR)(LF)	[Sub-offset level]

LIN mode:

"REFL"**.*(CR)(LF)	[Sub-reference level]
"SSCLN"*.****(CR)(LF)	[Sub-level scale]
"SMIN"**.**(CR)(LF)	[Sub-base level]

dB/km mode:

"REFL"-**.*(CR)(LF)	[Sub-reference level]
"SSKM"**.*(CR)(LF)	[Sub-level scale]
"OFSKM"***.*(CR)(LF)	[Sub-offset level]
"LENG"**.***(CR)(LF)	[Optical fiber length]

% mode:

"REEFL"-**.*(CR)(LF)	[Sub-reference level]
"SSPS"***.*(CR)(LF)	[Sub-level scale]
"SMINP"***.*(CR)(LF)	[Sub-base level]

For the measurement sensitivity format given in paragraph ⑧, one of the following data is output depending on the measurement sensitivity type:

"PLSLPF"(CR)(LF)	[LPF mode]
"PLSPKH"****(CR)(LF)	[Peak Hold mode]
"PLSEXT"(CR)(LF)	[External Trigger mode]
"HIGH 1"(CR)(LF)	[HIGH SENS 1]
"HIGH 2"(CR)(LF)	[HIGH SENS 2]
"HIGH 3"(CR)(LF)	[HIGH SENS 3]
"NR_HLD"(CR)(LF)	[NORMAL RANGE HOLD]
"NR_AT"(CR)(LF)	[NORMAL RANGE AUTO]

For the waveforms type format given in paragraph ⑪, one of the following data is output depending on the waveforms type:

"MEAS"(CR)(LF)	[Write mode]
"MAXH"(CR)(LF)	[Max Value Detect mode]
"MINH"(CR)(LF)	[Min Value Detect mode]
"RAVG"***(CR)(LF)	[Sequential Addition mode]
"A-B"(CR)(LF)	[Subtract A by B mode (LOG)]
"B-A"(CR)(LF)	[Subtract B by A mode (LOG)]
"A-BL"(CR)(LF)	[Subtract A by B mode (LIN)]
"B-AL"(CR)(LF)	[Subtract B by A mode (LIN)]
"A+BL"(CR)(LF)	[Add A by B mode (LIN)]
"NORM"(CR)(LF)	[Normalizing waveforms display mode]
"DOMI"(CR)(LF)	[Visual sensitivity compensation waveforms display mode]
"CVFT"**(CR)(LF)	[Curve fit display mode]
"CVFTPK"**(CR)(LF)	[Peak curve fit display mode]

7.8 Data Compatibility with AQ-6312A/B Optical Spectrum Analyzer

Out of the data stored by the floppy disk function of the AQ-6312A/B, waveform data can be read into a floppy disk of this equipment. However, program data has no compatibility and cannot be read.
The waveform data of the AQ-6312A/B is read as follows.

(1) Both ordinary waveforms and 3-dimensional display waveforms can be read.

(2) For measuring conditions, read information is used. However, the information on only this equipment is not changed.

(3) Because there is a difference in the number of display points between waveform data, waveform data is converted from 581 points into 1001 points before it is displayed.

Chapter 8 MEASUREMENT EXAMPLES

This chapter describes functions taking measurement examples so that even an inexperienced operator may make measurement smoothly by this equipment.

Contents of Chapter 8

8.1 Basic Measurement 8-2

- 8.1.1 Measurement by the [SWEEP] switch, <AUTO>key 8-2
- 8.1.2 Measurement by manual operations 8-4
- 8.1.3 Measuring sensitivity selection 8-6
- 8.1.4 Averaging times selection 8-8

8.2 Applied Measurement 8-9

- 8.2.1 Spectral width measurement 8-9
- 8.2.2 SMSR measurement 8-11
- 8.2.3 Loss wavelength characteristic measurement 8-13
- 8.2.4 Optical filter transmission factor measurement 8-18

8.3 Usage of Markers 8-21

- 8.3.1 Marker names 8-21
- 8.3.2 ▽ marker 8-21
- 8.3.3 Wavelength line marker 8-23
- 8.3.4 Level line marker 8-24
- 8.3.5 Auto search 8-25
- 8.3.6 Wavelength difference and level difference measurement 8-26

8.4 Convenient Functions 8-27

- 8.4.1 Marker-to-marker sweep function 8-27
- 8.4.2 Marker-to-marker power measurement function 8-29
- 8.4.3 0 nm sweep function 8-30
- 8.4.4 Normalization display function 8-32
- 8.4.5 Dominant display function 8-33
- 8.4.6 Three-dimensional display function 8-35

8.1 Basic Measurement

8.1.1 Measurement by the [SWEEP] switch, <AUTO>key

When the wavelength and level of input light are unknown, the <AUTO> key is used.
The measurement procedure is shown below.

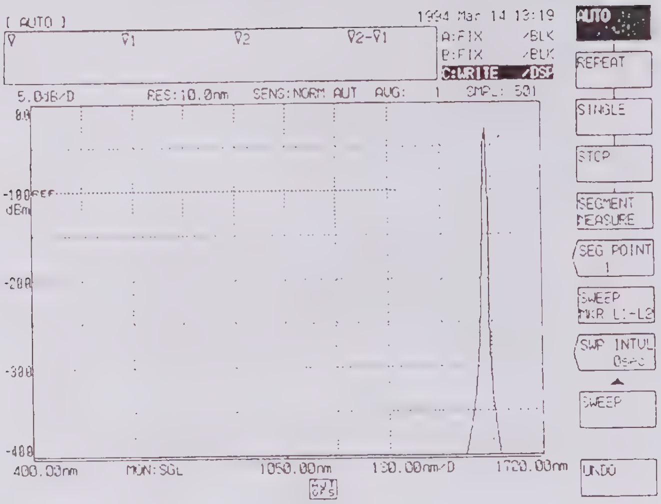
(1) Connect a light source to be measured to the [OPTICAL INPUT] connector.

(2) Press the [SWEEP] switch and then the soft key <AUTO>.

(3) This equipment analyzes the spectrum of the input light and automatically sets the mean wavelength, sweep width, reference level and resolution. Figure 8-1 shown a measurement example.
After completion of automatic setting, the soft key select status changes from the <AUTO> key to the <REPEAT> key and sweep processing is executed repeatedly.
(→ 5.1.1 [SWEEP] switch)

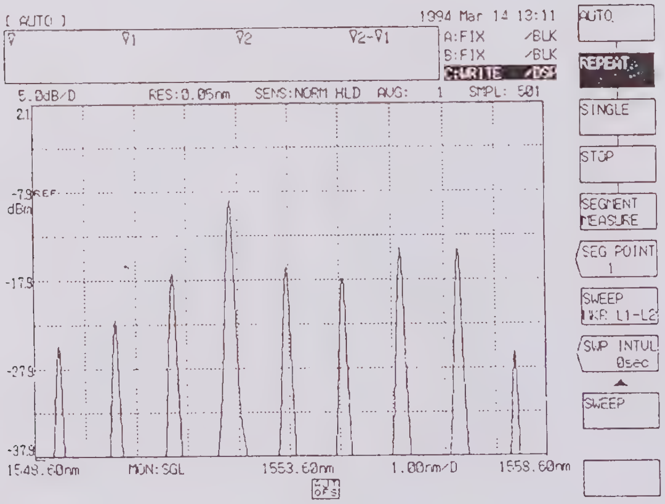
(4) After completion of automatic setting, if you desire to change measuring conditions, change them by the [FUNCTION] section.

First sweep



```
[ AUTO ]                                        1994 Mar 14 13:19
                                                A:FIX   /BLK
                                                B:FIX   /BLK
                                                C:WRITE /DSP
5.0dB/D    RES:10.0nm   SENS:NORM AUT   AVG:   1   SMPL: 501
400.00nm   MON:SGL   1050.00nm   130.00nm/D   1720.00nm
```

Sweep after completion of automatic setting



```
[ AUTO ]                                        1994 Mar 14 13:11
                                                A:FIX   /BLK
                                                B:FIX   /BLK
                                                C:WRITE /DSP
5.0dB/D    RES:0.05nm   SENS:NORM HLD   AVG:   1   SMPL: 501
1548.60nm   MON:SGL   1553.60nm   1.00nm/D   1558.60nm
```

Fig. 8-1 Measurement Example by <AUTO> key

8.1.2 Measurement by manual operations

In case desired measuring conditions cannot be obtained by measurement using the <AUTO> key, set each measuring condition manually by using the switches in the [FUNCTION] section.
Taking LD light source (wavelength: approx. 1552 nm, level: approx. –10 dBm) measurement as an example, the procedure will be described below.

(1) Connect the light source to be measured to the [OPTICAL INPUT] connector.

(2) Press the [CENTER] switch and set the center wavelength of the light source by the rotary knob or step keys. In the case of this example, set the mean wavelength to 1552 nm.
For this setting, you may enter [1] [5] [5] [2] [nm/ENTER] by the ten-key pad.

(3) Press the [SPAN] switch and set a wider sweep width than the spectral width of the light source by the rotary knob or step keys. In the case of this example, set the sweep width to 100 nm.
You may enter [1] [0] [0] [nm/ENTER] by the ten-key pad.

(4) Press the [LEVEL] switch and set the light source level to the reference level by the rotary knob or step keys. In the case of this example, set –10 dBm in the reference level.
You may enter [–] [1] [0] [nm/ENTER] or [µm/ENTER] by the ten-key pad.

(5) Press the [LEVEL] switch and then the soft key <LVL SCALE>.
Set the level scale to 5 dB/VID by the rotary knob or ten-key pad.
You may enter [5] [nm/ENTER] or [µm/ENTER] by the ten-key pad.

(6) Press the [SETUP] switch and then soft key <RESOLN>.
Set the resolution to MINIMUM (10 nm) by the rotary knob or step keys.
You may enter [1] [0] [nm/ENTER] by the ten-key pad.

(7) Press the [SETUP] key and then the soft key <AVERAGE TIMES>.
Set the number of averaging times to 1 by the rotary knob or step keys.
You may enter [1] [nm/ENTER] or [µm/ENTER] by the ten-key pad.

(8) Press the [SETUP] switch and then the soft key <SENS>.
Set the measuring sensitivity to NORM RANG HOLD by the rotary knob or step keys.

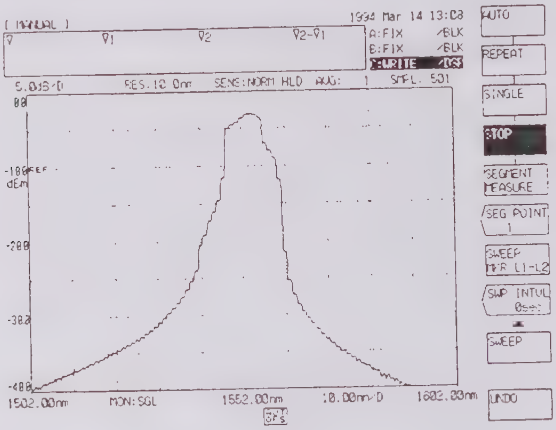
(9) Press the [SWEEP] switch and then the soft key <REPEAT> to execute repeat sweep processing

(10) Watching the measurement result (waveform), change each measuring condition of (3) to (8) to a proper value.
The setting standard is shown below:
- The center wavelength is set to the peak wavelength of the waveform.
- The sweep width is set to the range where the whole waveform is visible.
- The reference level is set to the peak level of the waveform.
- The resolution is set to the level where the waveforms do not change.
- For the number of averaging times, refer to 8.1.4 Averaging times selection.
- For the measuring sensitivity, refer to 8.1.3 Measuring sensitivity selection.

Figure 8-2 shows a measurement example using manual operations.

(11) To stop the sweep processing, press the [SWEEP] switch and then the soft key <STOP>.

First sweep



Final waveform by manual setting

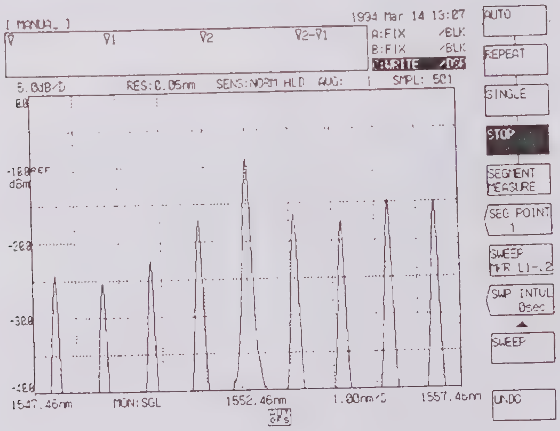


Fig. 8-2 Measurement Example Using Manual Operations

8.1.3 Measuring sensitivity selection

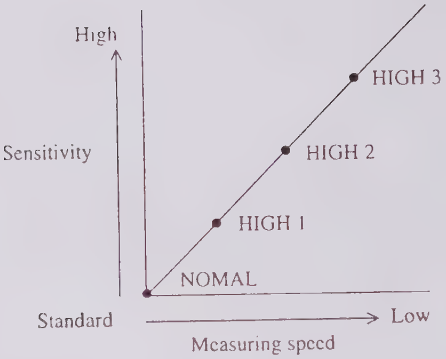
This equipment permits selecting 5 types of measuring sensitivity.

(1) For measuring sensitivity selection, press the [SETUP] switch and then the soft key <SENS>. When the key is pressed, the current measuring sensitivity is displayed in the interrupt display section. One of NORMAL RANGE HOLD, NORMAL RANGE AUTO, HIGH1, HIGH2 and HIGH3 can be selected by the rotary knob or step keys. (→ 5.1.5 [SETUP] switch, (2) <SENS> key)
Table 8-1 shows the contents of each measuring sensitivity.

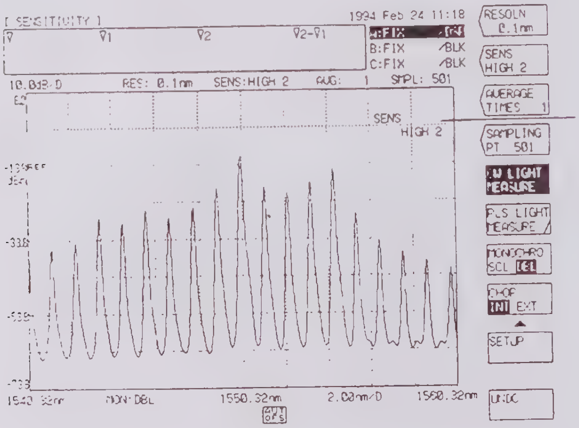
Table 8-1 Measuring Sensitivity Selection

Measuring sensitivity	Contents	Measuring sensitivity display section
NORMAL RANGE HOLD	Measurement is made with the AMP range fixed.	SENS: NORM HLD
NORMAL RANGE AUTO	Measurement is made 3 times changing the AMP range internally and a combination of data measured in each range is displayed. When the number of averaging times is set to 2 or more by the <AVERAGE TIMES> key of the [SETUP] switch, measurement is made by auto range.	SENS: NORM AUT
HIGH1	Measurements is made by the synchronous detection method internally chopping the light to be measured. "HIGH1", "HIGH2" or "HIGH3" is available depending on the auto range setting width and band width. "HIGH3" has the best measuring sensitivity but the lowest measuring speed.	SENS: HIGH1
HIGH2		SENS: HIGH2
HIGH3		SENS: HIGH3

(2) Supposing that the standard measuring speed is provided when the measuring sensitivity is set at NORMAL ("NORMAL" : NORMAL RANGE HOLD, NORMAL RANGE AUTO) ; as the sensitivity becomes better, the measuring speed becomes lower in the order of HIGH1, HIGH2 and HIGH3.



(3) The selected measuring sensitivity is displayed in the measuring sensitivity display section in the lower part of the screen.



RES: 0.1nm SENS:HIGH 2 AVG: 1 SMPL: 501

The measuring sensitivity is selected at "HIGH 2"

Select the measuring sensitivity by the rotary knob or step keys.

Display Made by Pressing <SENS> key

8.1.4 Averaging times selection

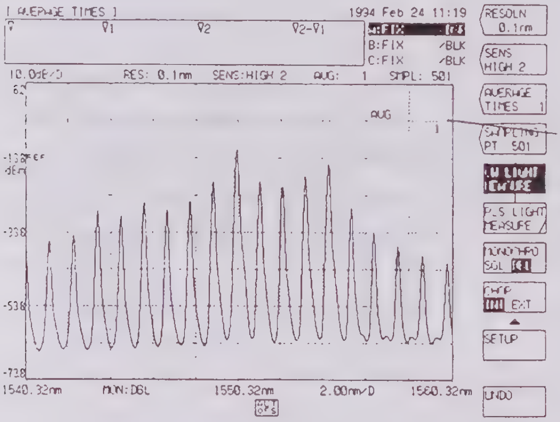
When the light source level fluctuates or the light source is modulated (below several kHz), the waveform is disturbed and this makes accurate measurement impossible.

In this case, increasing the number of averaging times permits accurate spectral measurement.

For selecting the number of averaging times, press the [SETUP] switch and then the soft key <AVERAGE TIMES>. Then, the current number of averaging times is displayed in the interrupt display section.

Any number can be selected in the range of 1 to 1000 by the rotary knob, step keys or ten-key pad.

(→ 5.1.5 [SETUP] switch, (3) <AVERAGE TIMES> key)



10.0dB/D RES: 0.1nm SENS:HIGH 2 AVG: 1 SMPL: 501

"1" is selected as the number of averaging times.

Select the number of averaging times by the rotary knob, step keys or ten-key pad.

Display Made by Pressing <AVERAGE TIMES> key

8.2 Applied Measurement

8.2.1 Spectral width measurement

The spectral width of LD, LED, etc. can be measured.

(1) To measure the spectral width of a waveform displayed on the screen, press the [ANALYSIS] switch.

(2) After the switch is pressed, the soft key menu is displayed.
The spectral width is calculated by an algorithm selected among the algorithms in Table 8-2 and the markers are displayed.

Table 8-2 Spectral Width Algorithms

Algorithm	Contents
ENV method	Obtains the spectral width from the envelope of the waveform.
THRESH method	Obtain the spectral width from the width of the point where the waveform intersects the threshold value.
RMS method	Obtains the spectral width from the standard divination of the waveform.

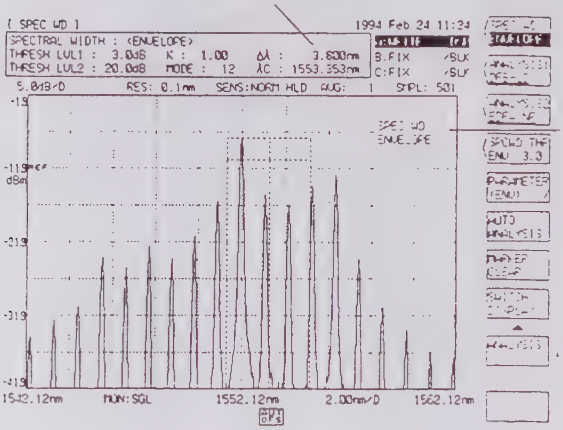
(3) To change the algorithm and threshold value or limit value, refer to 5.1.8 [ANALYSIS] switch.

(4) When the [ANALYSIS] switch is pressed, Δλ value is displayed in data area.
This value is regarded as the spectral width.
Also, λc shown in the data area indicates the center of spectrum width Δλ.

(5) To measure the spectral width at each sweep, cause the <AUTO ANALYSIS> key in the soft key menu displayed by pressing the [ANALYSIS] switch to be displayed in reverse video.
This function is convenient for monitoring the spectral width while executing sweep processing.

Spectral Width Measurement Example (1/2)

Spectral width

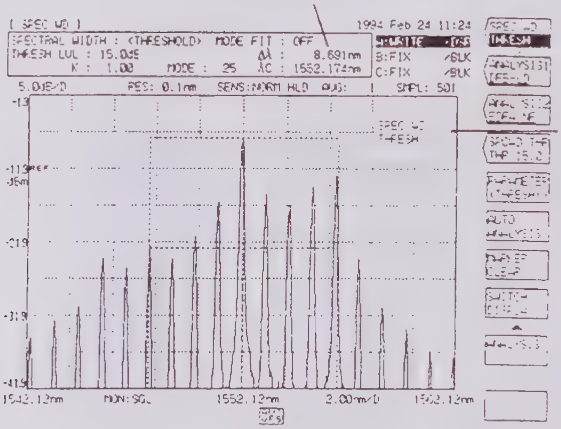


```
[ SPEC WD ]                                              1994 Feb 24 11:24
SPECTRAL WIDTH : <ENVELOPE>
THRESH LVL1 :  3.0dB   K :  1.00    Δλ :     3.800nm     B:FIX      /BLK
THRESH LVL2 : 20.0dB   MODE :  12   λC : 1553.353nm      C:FIX      /BLK
 5.0dB/D        RES: 0.1nm   SENS:NORM HLD   AVG:   1    SMPL: 501
```

Indicates that the spectral width was obtained by the ENV method.

ENV method

Spectral width



```
[ SPEC WD ]                                              1994 Feb 24 11:24
SPECTRAL WIDTH : <THRESHOLD>  MODE FIT : OFF
THRESH LVL : 15.0dB                 Δλ :     8.691nm     B:FIX      /BLK
         K :  1.00      MODE :  25  λC : 1552.174nm      C:FIX      /BLK
 5.0dB/D        RES: 0.1nm   SENS:NORM HLD   AVG:   1    SMPL: 501
```

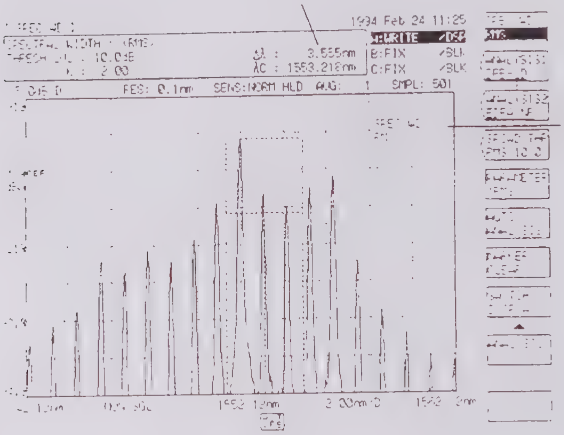
Indicates that the spectral width was obtained by the THRSH method.

The number of modes existing in the spectral width is 7.

THRESHOLD method

Spectral Width Measurement Example (2/2)

Spectral width



1994 Feb 24 11:25

Δλ : 3.555nm

λC : 1553.218nm

B:FIX

C:FIX

RES: 0.1nm SENS:NORM HLD AVG: 1 SMPL: 501

Indicates that the spectral width was obtained by the RMS method.

RMS method

8.2.2 SMSR measurement

This function can measure the SMSR of the DFB-LD.

NOTE

> *SMSR is an abbreviation for Side-Mode Suppression Ratio.*
> *The SMSR represents a level difference between the peak level and side mode level and used as a numeric value for performance evaluation of DFB-LD, etc.*

The procedure for SMSR measurement is as follows.

(1) Press the [ANALYSIS] switch.

(2) Press the <SMSR *> key in the soft key menu.

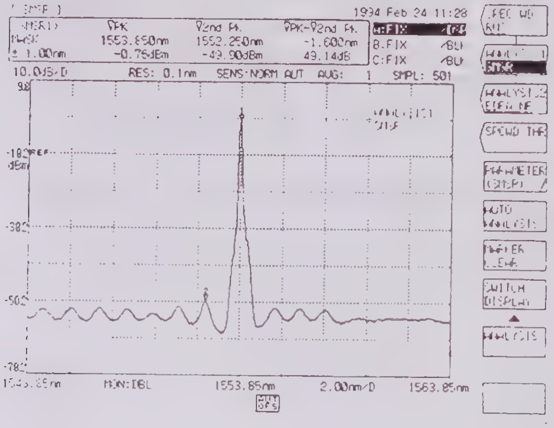
(3) The current set definition out of SMSR1 and 2 definitions is displayed in the interrupt display section and SMSR measurement is executed by this definition.

(4) An SMSR definition can be selected by the rotary knob, step keys or ten-key pad.
The markers are displayed in connection with this.

(5) Each definition of SMSR 1 and 2 is shown in 1) and 2).

1) When SMSR1 is selected:

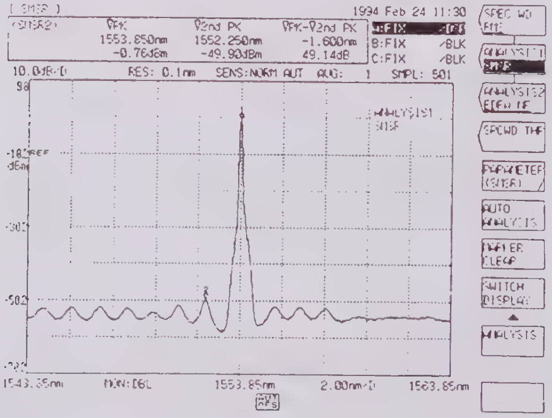
A level difference between the highest mode peak and the second highest mode peak (except mask setting range) is obtained by a single touch.



When SMSR1 is selected

2) When SMSR2 is selected:

A level difference between the highest mode peak and the higher of the right and left adjacent modes is obtained by a single touch.



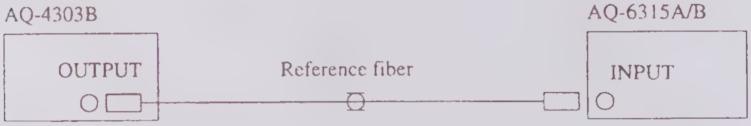
When SMSR2 is selected

8.2.3 Loss wavelength characteristic measurement

The loss wavelength characteristic of an optical fiber can be measured by using the subtract operation function.
A measurement example is shown below.
In this case, loss wavelength characteristic measurement is made for SM fiber 10 km in the range of 700 to 1700 nm.

(1) Figure 8-3 shows a loss wavelength characteristic measurement system.

[Reference value measurement]



[Comparison value measurement]

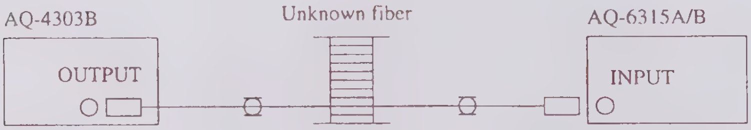


Fig. 8-3 Loss Wavelength Characteristic Measurement System

(2) Set the measuring conditions of this equipment as follows.
[CENTER] <START WL> : 700 nm
[CENTER] <STOP WL> : 1700 nm
[SETUP] <SAMPLING PT> : 101, [SET UP] <RESOLN> : 10 nm
[REF LEVEL] : –60 dBm, [SET UP] <AVERAGE TIMES> : 1 time
[SENS] : HIGH 3, [LEVEL] <LVL SCALE> : 10 dBm/div
For the AQ-4303B white light source, set 400 to 1800 nm.

NOTE

When the range of 400 to 1800 nm is set for the AQ-4303B, all the internal filters turn off and light of all the 400 to 1800 nm band wavelengths is emitted.

(3) Execute reference value measurement. The procedure for this measurement is as follows.

① As shown in the measurement system in Fig. 8-3 [Reference value measurement], connect this equipment to the AQ-4303B white light source by reference (short scale) fiber.

② Press the [TRACE] switch.

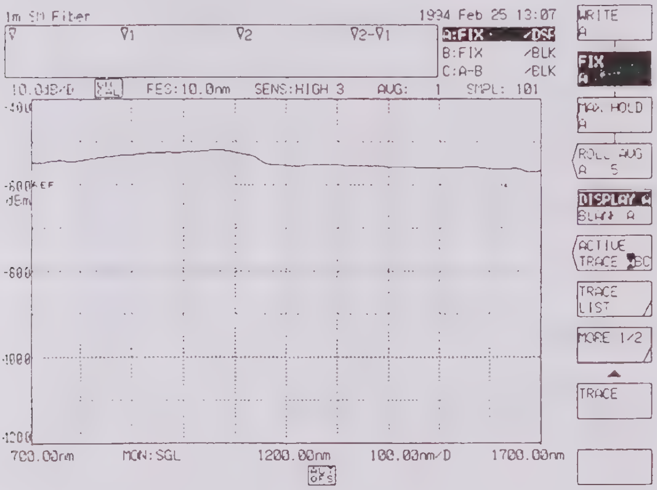
③ et the display in reverse video to "A" by the <ACTIVE TRACE A B C> key.
Then, the trace A becomes an active trace (measurement or setting enable trace).

④ Set the display in reverse video to "DISPLAY A" by the <DISPLAY A BLANK A> key.
Then, the trace A waveform is displayed or becomes ready to be displayed on the screen.

⑤ Press the <WRITE A> key to reverse the soft key display and put the trace A into the write mode.

⑥ Press the [SWEEP] switch and the soft key <SINGLE>. Measure the reference spectrum.

⑦ Press the [TRACE] switch after sweep, and press the <FIX A> soft key to fix trace A.



Reference Fiber Measurement Waveform

(4) Execute comparison value measurement. The procedure for this measurement is as follows.

① As shown in the measurement system in 8-3 [Comparison value measurement], change the fiber for connecting between this equipment and AQ-4303B white light source from the reference fiber to the fiber under measurement.

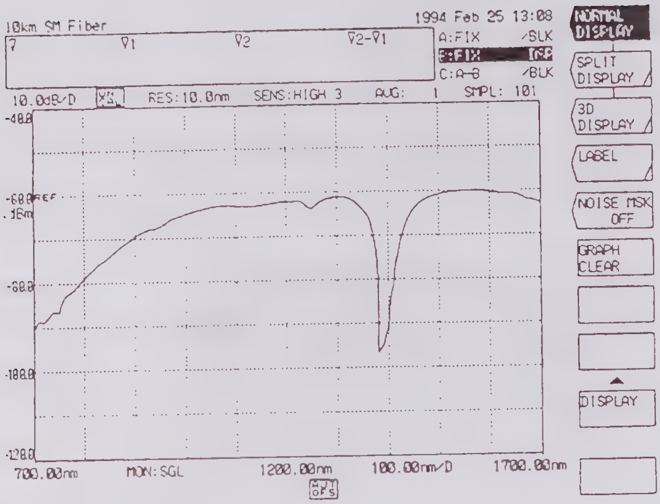
② Press the [TRACE] switch.

③ Set the display in reverse video to "B" by the <ACTIVE TRACE A B C> key.
Then, the trace B becomes an active trace.

④ Set the display in reverse video to "B" by the <DISPLAY B LANK B> key.
Then, the trace B waveform is displayed or becomes ready to be displayed on the screen.

⑤ Press the <WRITE B> key to reverse the soft key display and put the trace B into the write mode.

⑥ Press the [SWEEP] switch and then the soft key <SINGLE>. Measure the comparison spectrum.



Measured Waveform of Fiber under Measurement

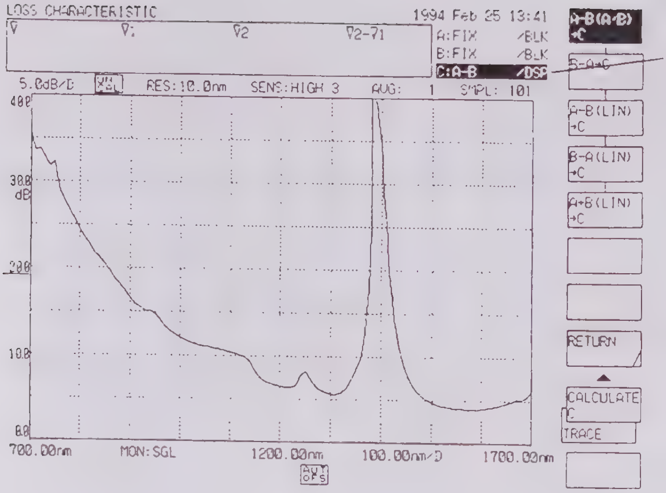
(5) Perform subtraction. The procedure for this measurement is as follows.

① Press the [TRACE] switch.

② Set the display in reverse video to "C" by the <ACTIVE TRACE A B C> key.
Then, the trace C becomes an active trace.

③ Set the display in reverse video to "DISPLAY C" by the <DISPLAY C BLANK C> key.
Then, the trace C waveform is displayed or becomes ready to be displayed on the screen.

④ When the <CALCULATE C> key is pressed, the comparison value is subtracted from the reference value and the result is copied to the trace C. (At this time, if <A–B (A/B) → C> of the soft key is not displayed in reverse video, press the soft key <A–B (A/B) → C>.)
The waveform resulting subtracting the spectrum of the trace B from the spectrum of the trace A is copied to the trace C and a subscale is displayed at the right of the screen.
(To display a subscale by auto scaling after subtraction, press the <AUTO SUB SCALE> key of the [LEVEL] switch to reverse it.)
The waveform displayed on the trace C represents the loss wavelength characteristic.

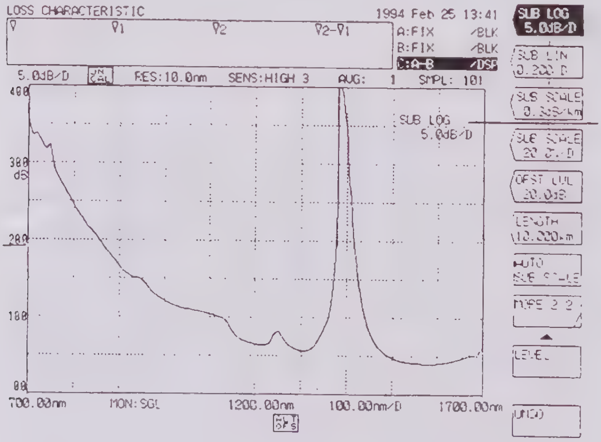


Indicates the A-B display status.

Display Made by Pressing <A–B (A/B) → C> key

(6) To change the displayed waveform into a desired scale, the subscale can be changed manually.

① To change the subscale, press the [LEVEL] switch and then the soft key <SUB LOG>.
When the <SUB LOG> key is pressed, the current subscale value is displayed in the interrupt display section.
The subscale value can be switched in the range of 0.1 dB/DIV to 10 dB/DIV with the medium value (underline) as a center by the rotary knob, step keys or ten-key pad.
The waveform is also changed at that time.



Sub scale value

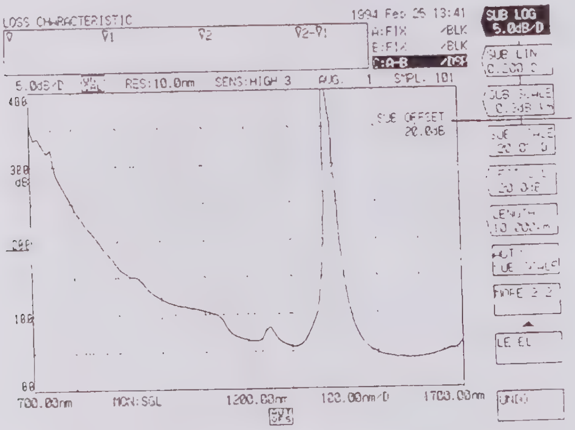
Scale Setting by <SUB LOG> key

② To change the offset value, press the [LEVEL] switch and then the soft key <OFST LVL>.

When the <OFST LVL> key is pressed, the current offset value (the value equal to the underlined characters) is displayed in the interrupt display section.

This value can be switched in the range of -99.9 dB to 99.9 dB by the rotary knob, step keys or ten-key pad.

The subscale display section and waveform are also changed at that time.



Level offset value

Offset Setting by <OFST LVL>

(7) To display the scale for the loss in a unit length (1 km), use the <SUB SCALE**.*dB/km> key.

① When the <SUB SCALE **.*dB/km> key is pressed, the current sub scale value is indicated in the interrupt display area.

The sub scale value can be changed from the center (underline) position within the range of 0.1 to 10.0 dB/km by the rotary knob, step keys, or numeric keys. The waveforms are also changed simultaneously.

② Press the <LENGTH**.***km> key to set the length of optical fiber under measurement.

It can be set from 0.001 to 99.999 km by the rotary knob, step keys, or numeric keys.

The on-screen waveforms has the loss wavelength characteristics in 1 km of optical fiber under test.

③ The offset can also be changed in the same procedure as Step ② of Paragraph (6).

8.2.4 Optical filter transmission factor measurement

The transmission factor of an optical filter can be measured by using the subtract operation function. A measurement example is shown below.

(For the subtract operation procedure, refer to 8.2.3 Loss wavelength characteristic measurement.)

(1) Figure 8-4 shows a transmission factor measurement system.

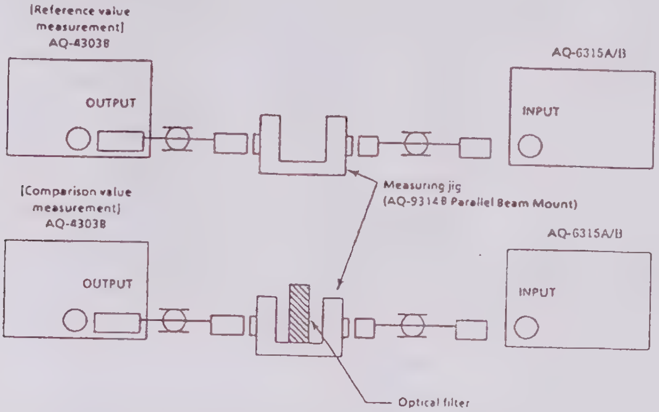
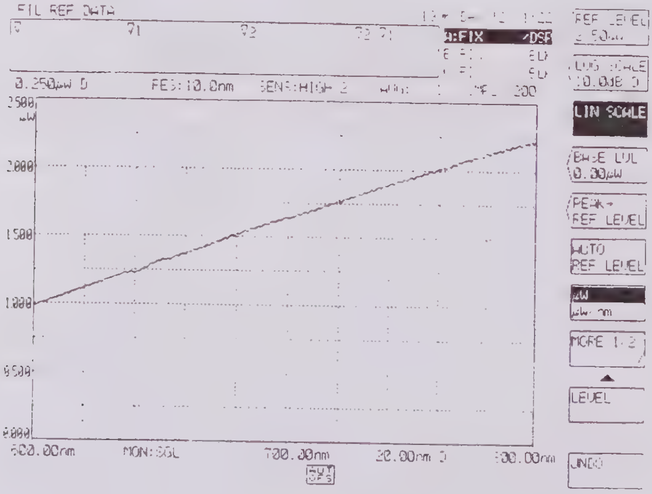

[Reference value measurement]
AQ-4303B
OUTPUT
AQ-6315A/B
INPUT
Measuring jig
(AQ-9314B Parallel Beam Mount)
[Comparison value measurement]
AQ-4303B
OUTPUT
AQ-6315A/B
INPUT
Optical filter

Fig. 8-4 Optical Filter Transmission Factor Measurement System

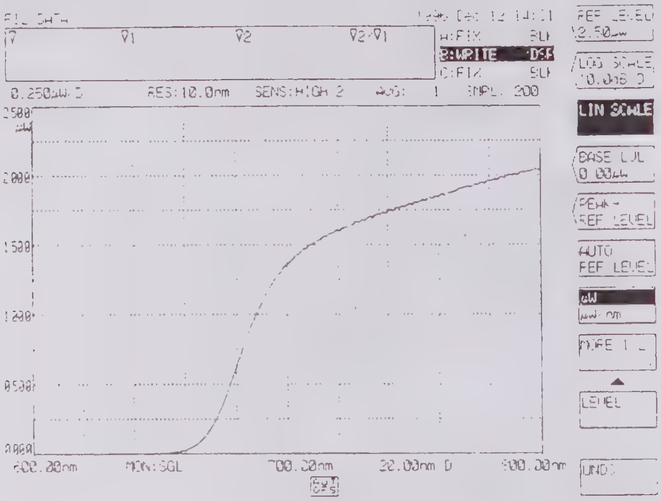
(2) Perform the reference value measurement shown in Fig. 8-4 by the trace A.

The waveform is shown below.



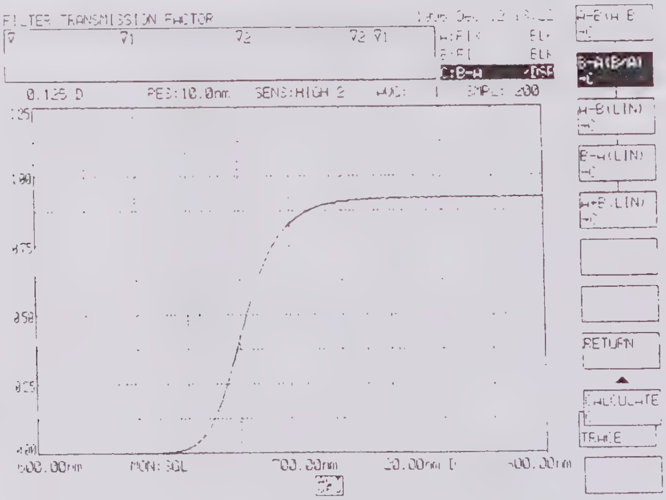
Reference Spectrum

(3) As shown in Fig. 8-4, measure the comparison spectrum by the trace B after inserting an optical filter. The waveform is shown below.



Comparison Spectrum

(4) To subtract the reference value from the comparison value, press the [TRACE] switch and set the display in reverse video to "C" by the soft key <ACTIVE TRACE A B C>, and then press the <CALCULATE C> key. (At this time, if the soft key <B-A → C> is not displayed in reverse video, press the <B-A → C> key.) Then, the waveform resulting from subtracting the spectrum of the trace A from the spectrum of the trace B is displayed. The displayed waveform represents the transmission factor.



Optical Filter Transmission Factor

(5) To perform auto scaling for the waveform that has undergone subtraction, refer to 8.2.3 Loss wavelength characteristic measurement.

(6) To change the on-screen waveforms to the desired scale, manually set the subscale.
The following explains how to change the subscale display to the percentage (%) mode.

① Press the [LEVEL] switch, and press the <SUB SCALE***.*%/D> software key.
The current sub scale value will be indicated in the interrupt display area.
The sub scale value can be changed from 0.1 to 125.0%/D by the rotary knob, step keys, or numeric keys.
The on-screen waveforms data is equal to the linear relational data multiplied by 100.
The transparency rate of optical filter can be displayed in percentage.

② To change the bottom value of the subscale, press the <SCALE MIN ***.*%> key.
The current value will be indicated in the interrupt display area.
The subscale value can be changed from 0 to the "/DIV" value of subscale multiplied by 10, by using the rotary knob, step keys, or numeric keys.

8.3 Usage of Markers

Using markers permit wavelength/level difference measurement, peak wavelength search, peak level search and spectral width search.
When using the markers, the [MARKER] switch of the [FUNCTION] section is used.

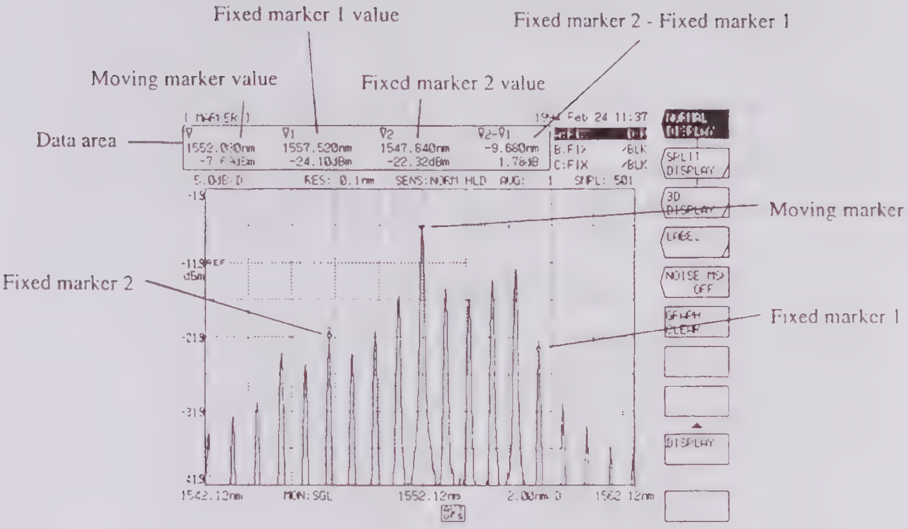
8.3.1 Marker names

There are two types of marker, namely, line marker and ▽ marker.
The line marker is classified into the wavelength line marker (for the axis of ordinates) and the level line marker (for the axis of abscissas). Two markers of each type are available.
The ▽ marker is classified into one moving marker and two fixed markers.
A total of 3▽ markers can be used.

8.3.2 ▽ marker

To search the peak wavelength and peak level (or bottom wavelength and bottom level) of the waveform displayed on the screen at the same time or to display the ▽ marker onto the screen, press the [PEAK SEARCH] switch or the [MARKER] switch.
Then, press the <MARKER> key in the displayed soft key menu.
The marker displayed by this operation is called "moving marker" which is moved in connection with the marker value (wavelength value and level value) ion the data area by the rotary knob or step keys.
Move the moving marker to any optional position and press the <SET MARKER 1> or <SET MARKER 2> key, and a fixed marker appears at that position.
The marker displayed by pressing the <SET MARKER 1> key is called "fixed marker 1", while the marker displayed by pressing the <SET MARKER 2> key is called "fixed marker 2".

(1) When the <MARKER> key is pressed, the moving marker is displayed on the active trace waveform in the middle of the screen and the marker value is displayed in the data area if no moving marker is not displayed yet.



▽1 1557.520nm -24.10dBm
▽2 1547.640nm -22.32dBm
▽2-▽1 -9.880nm 1.78dB
B:FIX /BLK
C:FIX /BLK
RES: 0.1nm SENS:NORM HLD AVG: 1 SMPL: 501

Example of ▽ Maker Display

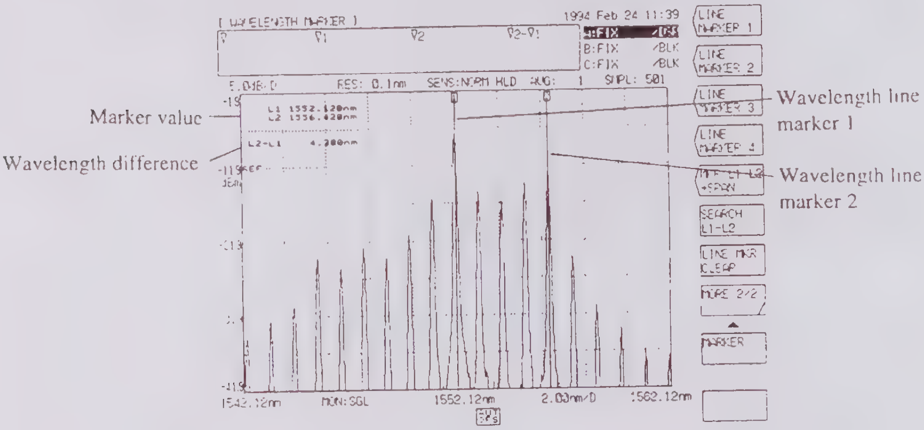
(2) The method of moving the moving marker is the same as that for the wavelength line marker.

(3) When the <MARKER CLEAR> key is pressed, all the ▽ markers and marker values displayed on the screen are cleared.

8.3.3 Wavelength line marker

To display the wavelength line marker onto the screen, press the [MARKER] switch and then the soft key <MORE 1/2>. In the soft key menu displayed by this operation, press the <LINE MARKER 1> or <LINE MARKER 2> key.

(1) When the key is pressed, the line marker is displayed at a 1/4 position from the left or right end of the screen and the marker value is displayed in the opposite position to the interrupt display section if the ▽ marker is not displayed yet. When both line markers 1 and 2 are displayed, difference of wavelength between them (L2 - L1) is shown below the marker value.



Example of Wavelength Line Marker Display

(2) Table 8-3 shows the method of moving the marker after it is displayed.

Table 8-3 Method of Moving Wavelength Line Marker

Wavelength line marker	Moving method
Movement to the right	Turn the rotary knob clockwise or press the step key [↑].
Movement to the left	Turn the rotary knob counterclockwise or press the step key [↓].

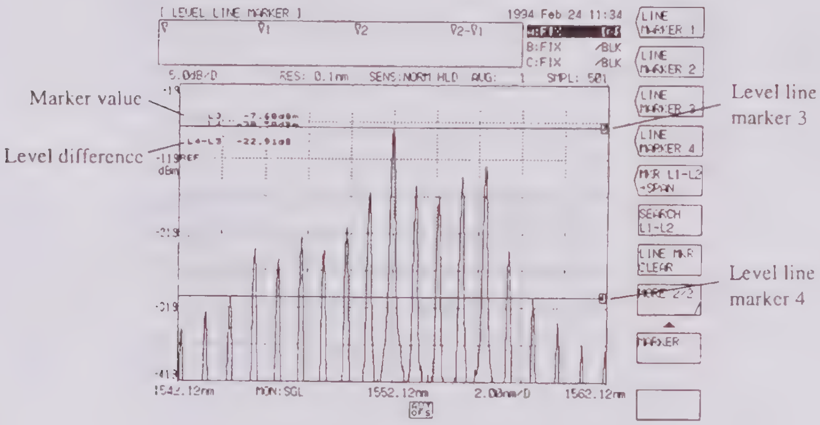
The marker value changed in real time in connection with the marker movement.
By pressing another key, the marker is fixed. When the same key is pressed once again, the marker is ready to move.

(3) When the <LINE MRK CLEAR> key is pressed, all the line markers and marker values on the screen are cleared.

8.3.4 Level line marker

To display the level line marker onto the screen, press the [MARKER] switch and then the soft key <MORE 1/2>.
In the soft key menu displayed by this operation, press the <LINE MARKER 3> or <LINE MARKER 4> key.

(1) When the key is pressed, the level line marker is displayed at the ▽ marker position if the ▽ marker is displayed or at a 1/4 position from the upper or lower end of the screen if the ▽ marker is not displayed, and the marker value is displayed on the opposite position of the interrupt display section.
When both line markers 3 and 4 are displayed, difference of wavelength between them (L4 - L3) is shown below the marker value.



Example of Level Line Marker Display

(2) Table 8-4 shows the method of moving the marker after it is displayed.

Table 8-4 Method of Moving Level Line Marker

Level line marker	Moving method
Movement to the up	Turn the rotary knob clockwise or press the step key [↑].
Movement to the down	Turn the rotary knob counterclockwise or press the step key [↓].

The marker value changed in real time in connection with the marker movement.
By pressing another key, the marker is fixed. When the same key is pressed once again, the marker is ready to move.

(3) When the <LINE MRK CLEAR> key is pressed, all the line markers and marker values on the screen are cleared.

8.3.5 Auto search

The peal level and peak wavelength or the bottom level and bottom wavelength can be automatically searched at each sweep. This function is useful for observing changes of the peak level and peak wavelength while repeat sweep processing is continued.

(1) Press the [PEAK SEARCH] switch and then the soft key <MORE 1/2>.
In the soft key menu displayed by this operation, press the <AUTO SEARCH> key to display it in reverse video.

(2) After the <AUTO SEARCH> key is pressed into a display in reverse video, press the [PEAK SEARCH] switch and then the soft key <PEAK SEARCH>.
After that, the peak level and peak wavelength are automatically searched at each sweep and moving marker is displayed.
After the [PEAK SEARCH] switch is pressed and also the soft key <BOTTOM SEARCH> is pressed, the bottom level and the bottom wavelength are automatically searched and the moving marker is displayed.

(3) To clear the auto search mode, press the <AUTO SEARCH> key once again to reset its display in reverse video to the initial status

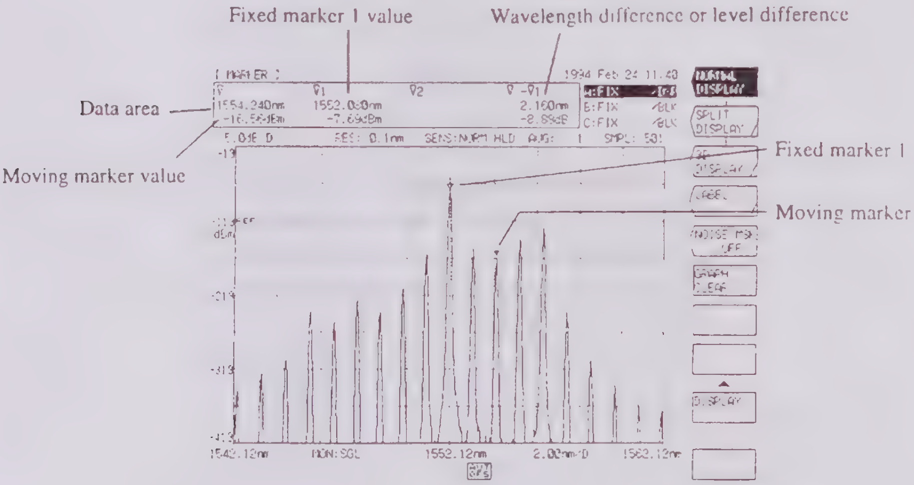
8.3.6 Wavelength difference and level difference measurement

The wavelength difference and level difference can be measured by using the fixed marker.

(1) Press the [PEAK SEARCH] switch or [MARKER] switch. In the soft key menu displayed by this operation, press the <MARKER> key to display the moving mark.

(2) Move the moving marker to an optional position and press the <SET MARKER 1> key. Then, the fixed marker 1 appears at that position and both wavelength value and level value of the fixed marker 1 are displayed at ▽1 in the data area.

(3) When the moving marker is moved further, the wavelength difference and level difference from the fixed marker 1 are displayed at the right end of the data area. The wavelength difference and level difference change in connection with the movement of the moving marker.



RES: 0.1nm SENS:NORM HLD AVG: 1 SMPL: 501

Wavelength Difference Measurement

(4) Move the moving marker to an optional position and press the <SET MARKER 2> key. The fixed marker 2 appears at that position and the wavelength difference and level difference between the fixed marker 1 and fixed marker 2 are fixed.

NOTE

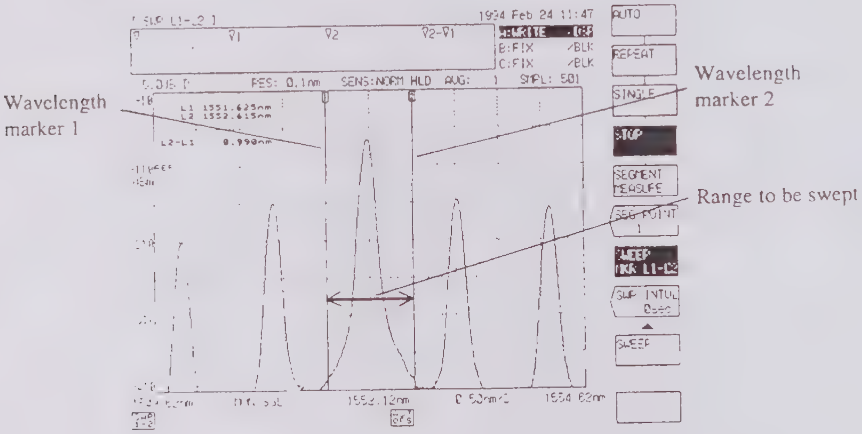
As a level difference, (fixed marker 2 - fixed marker 1) is displayed when the level axis is of LOG scale or (fixed marker 2 / fixed marker 1) is displayed when the level axis is of linear scale.

8.4 Convenient Functions

8.4.1 Marker-to-marker sweep function

The marker-to-marker sweep function permits a sweep between the wavelength line marker 1 and wavelength line marker 2.
Because the sweep range is limited to the section between the marker 1 and marker 2, high-speed sweep processing can be executed.
This function is useful for observing variations in a specific portion of the spectrum.
(→ 5.1.1 [SWEEP] switch)

(1) Set the wavelength line marker 1 and wavelength line marker 2 to both sides of the range to be swept.



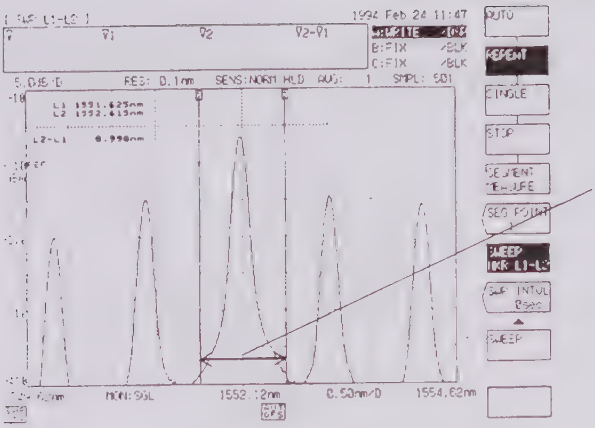
Wavelength marker 1

Wavelength marker 2

Range to be swept

Marker-to-Marker Sweep Range Setting

(2) Press the [SWEEP switch]. In the soft key menu displayed by this operation, press the <SWEEP MKR L1-L2> key to display it in reverse video.
When the <REPEAT> or <SINGLE> key is pressed, the marker-to-marker sweep function is executed and a repeat or single sweep is performed between the wavelength line marker 1 and wavelength line marker 2.



Only this range is swept.

After Execution of Marker-to-Marker Sweep Function

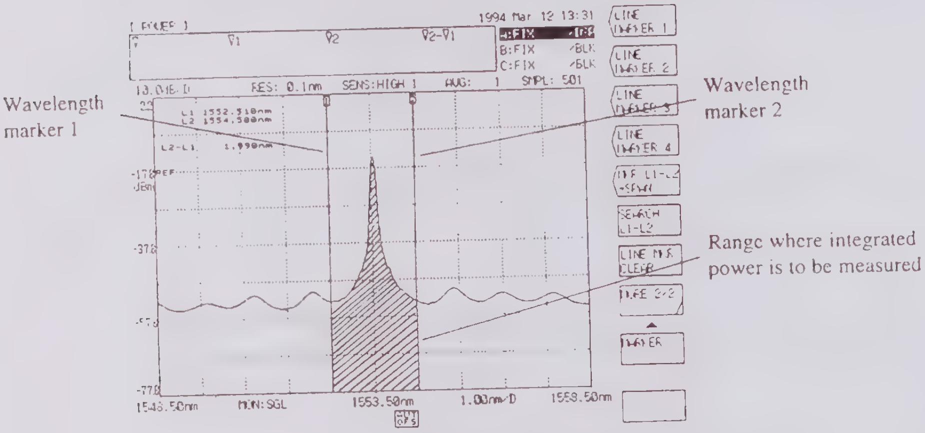
(3) To cancel the marker-to-marker sweep function, press the [SWEEP] switch. In the soft key menu displayed by this operation, press the <SWEEP MKR L1-L2> key again to reset its display in reverse video into the initial status.

After the display in reverse video is reset to the initial status, the marker-to-marker sweep function is canceled and sweep processing is executed for all the range of the screen.

8.4.2 Marker-to-marker power measurement function

On a displayed waveform, the integrated power of the portion enclosed by the wavelength line marker 1 and wavelength marker 2 can be obtained.
(→ 5.1.8 [ANALYSIS] switch, (6) <POWER> key)
This function is useful for ASE evaluation of an optical amplifier.

(1) Set the wavelength line marker 1 and wavelength line marker 2 on both sides of the range where integrated power is to be measured.



Wavelength marker 1

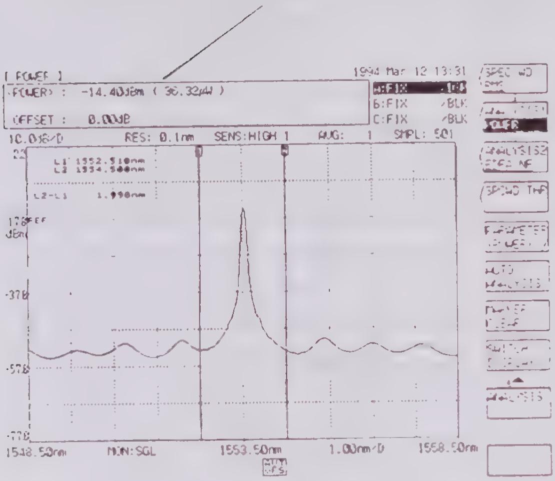
Wavelength marker 2

Range where integrated power is to be measured

Marker-to-Marker Power Measurement Range Setting

(2) Press the [MARKER] switch and then the soft key <MORE 1/2>.
In the soft key menu displayed by this operation, press the <SEARCH L1-L2> key to display it in reverse video.

(3) Press the [ANALYSIS] key. In the displayed soft key menu, press the <POWER> key to display it in reverse video.
When the key is pressed, marker-to-marker power measurement is executed and the integrated power of the hatched portion in the above figure is calculated. The obtained integrated power value is displayed in the data area.
When the <POWER> key is pressed unless the <SEARCH L1-L2> key is displayed in reverse video, integrated power calculation is performed for all range of the screen.



The integrated power value is displayed.

[POWER]
<POWER> : -14.40dBm (36.32µW)
OFFSET : 0.00dB
10.0dB/D RES: 0.1nm SENS:HIGH 1 AVG: 1 SMPL: 501
1994 Mar 12 13:31
A:FIX /DSP
B:FIX /BLK
C:FIX /BLK
L1 1552.510nm
L2 1554.500nm
L2-L1 1.990nm

After Execution of Marker-to-Marker Power Measurement Function

(4) To cancel the marker-to-marker power measurement function, press the [ANALYSIS] switch and then the spectral width search or SMSR measurement soft key to display it in reverse video.
When the key is displayed in reverse video, the [ANALYSIS] switch executes the function of the soft key displayed in reverse video.

8.4.3 0 nm sweep function

This function measures a secular change of level with a specific wavelength, and is useful for optical axis alignment in entering the light source into an optical fiber.
(→ 5.1.3 [SPAN] switch)
Taking a case where the He-Ne gas laser (632.8 nm) space light enters an optical fiber as shown in Figure 8-5, as an example, this function will be explained below.

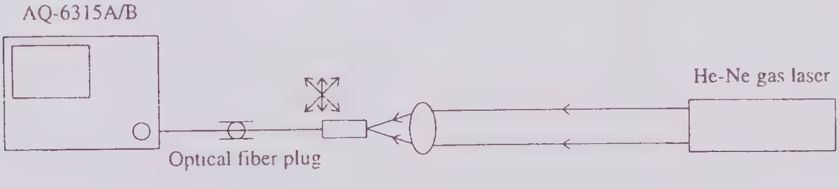


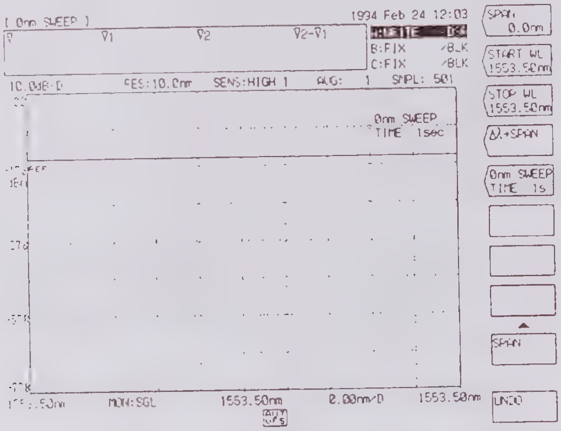
Fig. 8-5 Space Light Entering an Optical Fiber

(1) Set the mean wavelength of this equipment to 632.8 nm and the resolution to 10 nm.

(2) Set the sweep width to 0 nm, specifying a 0 nm sweep.
When the sweep width is set to 0 nm, all of sweep start wavelength, mean wavelength and sweep end wavelength are set to 632.8 nm, so that the axis of abscissas becomes a time axis.

(3) With the 0 nm sweep set, the time required for a sweep from the left end to the right end of the screen can be set by the <0 nm SWEEP TIME> key in the soft key menu displayed by pressing the [SPAN] switch.

(4) Press the soft key <REPEAT> after pressing [SWEEP] key.
When the switch is pressed, it is possible to observe a secular change of level at 632.8 nm at which repeat sweep processing is executed.



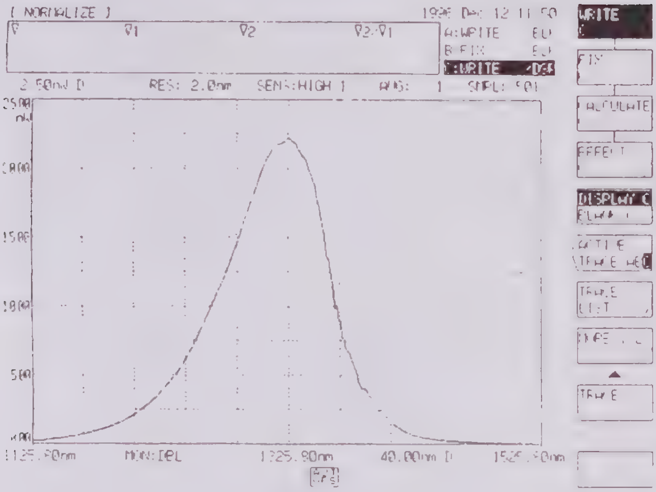
0 nm Sweep

(5) While observing the displayed waveform, move the optical fiber plug slightly to cause the incident amount of the light source to go to the peak value.

8.4.4 Normalization display function

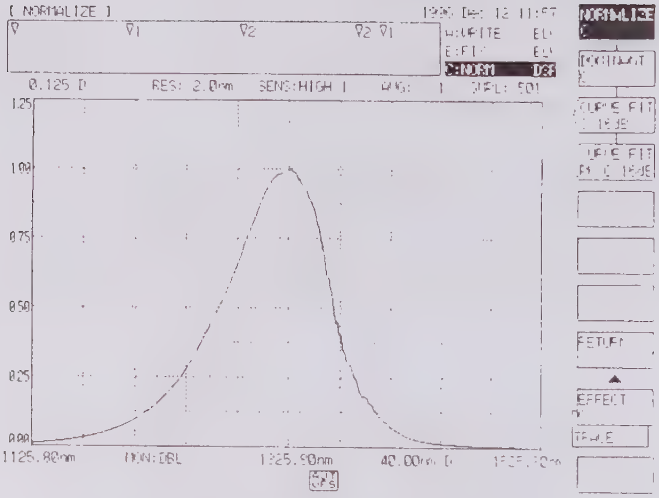
This function displays a waveform in normalized form.
(→ 5.1.9 [TRACE] switch, (30) <NORMALIZE C> key)

(1) Display a waveform to be normalized onto the screen.



Before Execution of Normalize Display Function

(2) Press the [TRACE] switch and then the <ACTIVE TRACE A B C> key. In the soft key menu displayed by this operation and setting the display in reverse video to "C", press the <EFFECT C> key.
Next, press the <NORMALIZE C> key.
When the key is pressed, the waveform peak is set to 1 dB when the subscale is a linear scale or to 0 dB when the subscale is a LOG subscale, and the waveform is normalized and then displayed.
"C:NORM/DSP (or BLK)" is displayed in the trace status display section. This indicates that the waveform has been processed by this function.
If the waveform level is too low, this function is not executed.

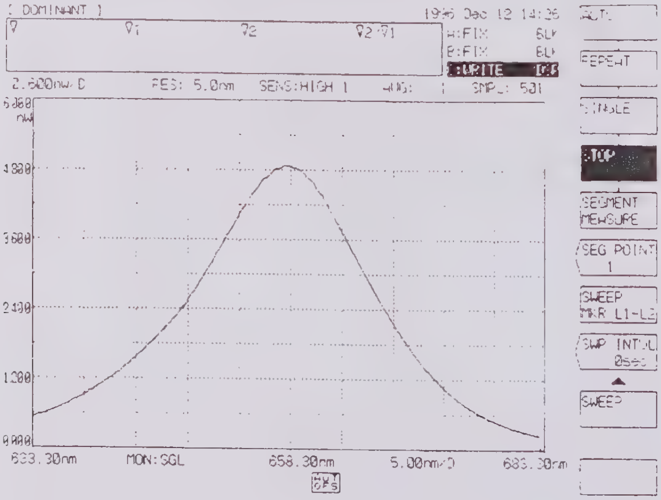


Display Made by Pressing <NORMALIZE C> key

8.4.5 Dominant display function

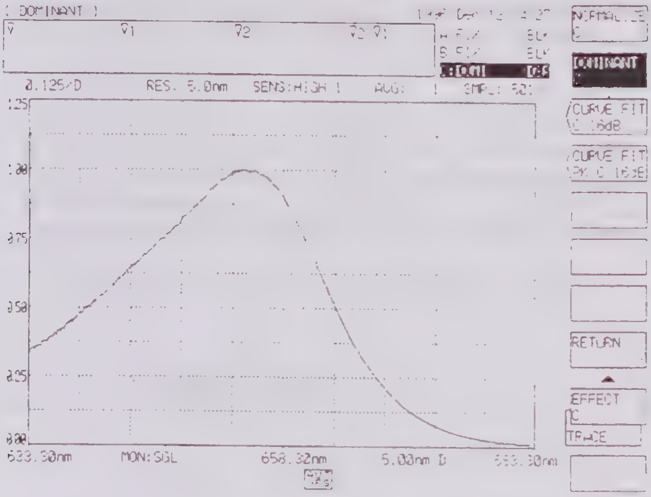
This function performs human spectral luminous efficacy compensation for a displayed waveform and displays the compensated waveform in normalized form. (→ 5.1.9 [TRACE] switch, (31)<DOMINANT C> key)

(1) Display a target waveform for spectral luminous efficacy onto the screen.



Before Execution of Spectral Luminous Efficacy Display Function

(2) Press the [TRACE] switch and then the <ACTIVE TRACE A B C> key. In the soft key menu displayed by this operation and setting the display in reverse video to "C", press the <EFFECT C> key.
Next, press the <DOMINANT C> key.
"C:DOMI/DSP (or BLK)" is displayed in the trace status display section. This indicates that the waveform has been processed by this function. When any wavelength range exceeding the human spectral luminous efficacy area is included on the display screen or when the waveform level is too low, this function is not executed.
The peak wavelength of the waveform processed by the spectral luminous efficacy compensation function is different from a dominant waveform.



Display Made by Pressing <DOMINANT C> key

8.4.6 Three-dimensional display function

The three-dimensional display function can simultaneously display 3 to 16 spectrums with the Z-axis (direction of depth) added to the normal display. (→ 5.1.3 [DISPLAY] switch, (3) 3D DISPLAY> key, (13) <ANGLE> key and (15) <Z-SCALE> key)

On the three-dimensional display, the newest waveform is displayed most forward at each sweep and the existing waveforms are fed backward one after another.

When a sweep is performed at time intervals, the Z axis represents the time elapsed.

Accordingly, a secular change of the light source spectrum can be observed.

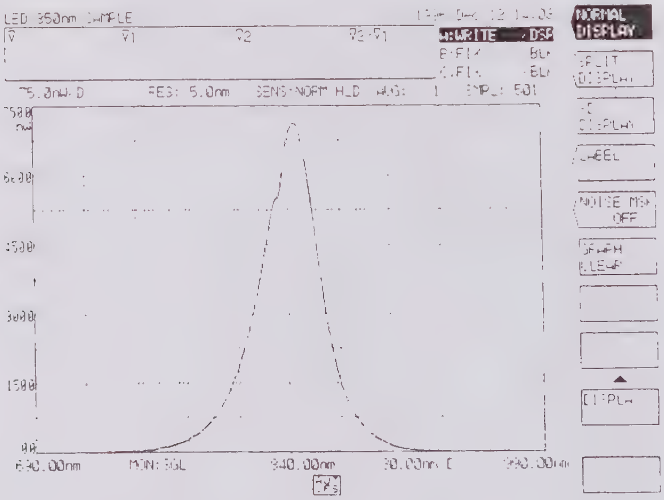
When a sweep is performed changing light source parameters (temperature, LD bias current, etc.), the Z axis represents these parameters at measurement.

Taking a case where a secular change of spectrum is observed at intervals of 10 seconds by using the three-dimensional display function, as an example, this function will be explained as follows.

NOTE

> *In the three-dimensional display mode, the waveforms displayed by the step keys can be selected by use of the marker. The parameters can be changed by the rotary control knob or numeric keys.*

(1) On the ordinary display screen, set measuring conditions suitable for measuring the spectrum.



RES: 5.0nm SENS:NORM HLD AVG: 1 SMPL: 501

Measuring Condition Setting on Ordinary Screen

(2) Press the [SWEEP] switch. In the soft key menu displayed by this operation, press the <SWP INTVL> key.
Set the WAIT time to 10 s and press the [nm/ENTER] or [μm/ENTER] key.
(→ 5.1.1 [SWEEP] switch, (8)<SWP INTVL> key)

8.4.6 Three-dimensional display function

The three-dimensional display function can simultaneously display 3 to 16 spectrums with the Z-axis (direction of depth) added to the normal display. (→ 5.1.3 [DISPLAY] switch, (3) 3D DISPLAY> key, (13) <ANGLE> key and (15) <Z-SCALE> key)

On the three-dimensional display, the newest waveform is displayed most forward at each sweep and the existing waveforms are fed backward one after another.

When a sweep is performed at time intervals, the Z axis represents the time elapsed.

Accordingly, a secular change of the light source spectrum can be observed.

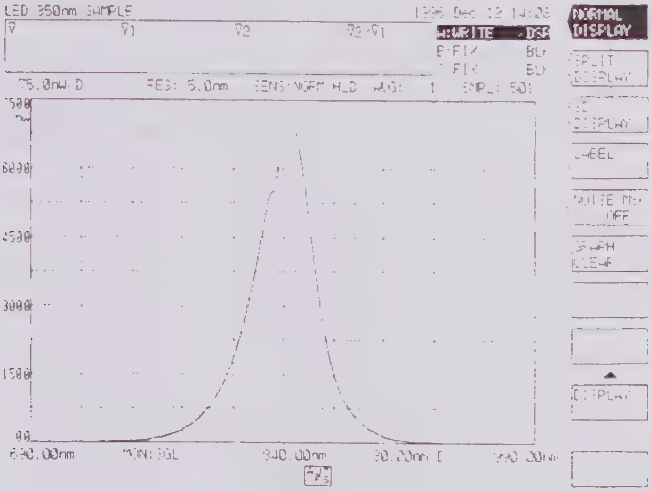
When a sweep is performed changing light source parameters (temperature, LD bias current, etc.), the Z axis represents these parameters at measurement.

Taking a case where a secular change of spectrum is observed at intervals of 10 seconds by using the three-dimensional display function, as an example, this function will be explained as follows.

NOTE

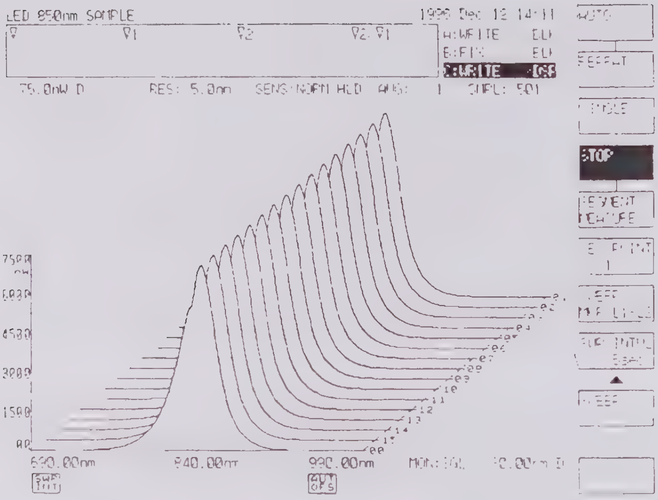
> *In the three-dimensional display mode, the waveforms displayed by the step keys can be selected by use of the marker. The parameters can be changed by the rotary control knob or numeric keys.*

(1) On the ordinary display screen, set measuring conditions suitable for measuring the spectrum



Measuring Condition Setting on Ordinary Screen

(2) Press the [SWEEP] switch. In the soft key menu displayed by this operation, press the <SWP INTVL> key.
Set the WAIT time to 10 s and press the [nm/ENTER] or [µm/ENTER] key.
(→ 5.1.1 [SWEEP] switch, (8)<SWP INTVL> key)



Display Made by Pressing <REPEAT> key (3-dimensional display screen)

Chapter 9 GP-IB FUNCTIONS

This chapter describes the GP-IB functions.

Contents of Chapter 9

9.1 GP-IB 1 Port and GP-IB 2 Port 9-2

9.2 Usage of GP-IB 1 Port 9-3

- 9.2.1 Interface functions of GP-IB 1 port 9-3
- 9.2.2 Connection to GP-IB system 9-3
- 9.2.3 Address setting 9-4
- 9.2.4 Local/remote function 9-4
- 9.2.5 Program codes (commands) 9-4
- 9.2.6 Output data 9-36
- 9.2.7 Service request function 9-48
- 9.2.8 Precautions on programming 9-50
- 9.2.9 Program code compatibility with AQ-6312A/B 9-51
- 9.2.10 Programming examples 9-52

9.3 Usage of GP-IB 2 Port 9-61

- 9.3.1 Interface functions of GP-IB 2 port 9-61
- 9.3.2 Connection to GP-IB system 9-61
- 9.3.3 Address setting 9-62
- 9.3.4 X-Y plotter control 9-62
- 9.3.5 External unit control 9-62

9.1 GP-IB 1 Port and GP-IB 2 Port

This equipment can be controlled externally by the GP-IB (conforming to IEEE-488, and also can control other external units when this equipment itself functions as a controller.
There are two GP-IB ports (connectors) on the rear panel of this equipment.

- GP-IB 1
  Used to control this equipment remotely by a controller such as personal computer.
  This port connects the controller and other units to be controlled by this controller.

- GP-IB 2
  Used to control external units when this equipment itself functions as a controller.
  This port connects the X-Y plotter and external units to be controlled by the program functions of this equipment.

CAUTION

- *Even if a controller such as a personal computer is connected to the GP-IB 2 port, it is impossible to control this equipment remotely.*
- *Even it external units to be controlled by the X-Y plotter or program functions are connected to the GP-IB 1 port, they cannot be operated.*
- *These two GP-IB ports are independent of each other. Accordingly, it is impossible to send messages directly from a controller connected to the GP-IB 1 port to an external unit connected to the GP-IB 2 port.*

9.2 Usage of GP-IB 1 Port

9.2.1 Interface functions of GP-IB 1 port

Table 9-1 shows the interface functions of the GP-IB 1 port.

Table 9-1 Interface Functions of the GP-IB 1 Port

Code	Interface function
SH1	All send functions
AH1	All receive functions
T6	Basic talker
	Serial polling
	Talker release by MLA
L4	Basic listener
	Listener release by MTA
SR1	All service request functions
PL1	All remote/local functions
PP0	No parallel polling function
DC1	All device clear functions
DT1	All device trigger functions
C0	No controller function
E1	Open collector driver

9.2.2 Connection to GP-IB system

Turn off the power supply of this equipment and the power supplies of the units (e.g., controller) to be connected to this equipment. Connect the units to the GP-IB 1 connector on the back panel of this equipment by GP-IB cord.

Tighten the fixing screw of the connector firmly.

CAUTION

If the GP-IB cord is connected or disconnected on the power ON status, this will cause a malfunction or failure to this equipment.

9.2.3 Address setting

The GP-IB address is set by the <MY ADRS> key of the [SYSTEM] switch. When the soft key is pressed, the current address is displayed in the interrupt display section of the screen.
Set the address to 0 to 30 by the rotary knob, step keys or ten key pad.

9.2.4 Local/remote function

(1) When REN and ATN are caused to go "true" by the controller and the listen address is sent, this equipment is put into the remote status.

(2) In the remote status, all the panel switches and soft keys except the <LOCAL> key become ineffective. The [REMOTE] lamp comes on to indicate the remote status.

(3) By pressing the <LOCAL> key, this equipment is returned to the local status and the switches on the panel are enabled.

(4) When the GTL (Go To Local) message is sent from the controller or REN is caused to go "false", this equipment can also be returned to the local status.

(5) When the LLO (Local Lock Out) message is sent from the controller, this equipment is put into the local lock out status. This status can not be returned to the local status by pressing the <LOCAL> key.
To reset the local lock out status, cause REN to go "false" by the controller.

9.2.5 Program codes (commands)

(1) Table 9-2 shows a program code (command) list of this equipment. If these program codes are sent from the controller in the remote status, this equipment performs the operations shown in the table.

(2) Several program codes can be sent in connected form by using "," for connection.
However, the receive buffer capacity of this equipment is 512 bytes.
When the total number of characters except blanks (including control codes), an excess of program codes is ignored.

(3) The following two delimiters are valid.
- CRLF
- EOI

(4) Every blank is ignored.

(5) All incorrect program codes are ignored

Table 9-2 GP-IB Program Codes (1/31)

(1) [FUNCTION] section

<table>
<tr><th>Function</th><th>Control command</th><th>Explanation</th><th>Talker command</th><th>Talker output data format</th></tr>
<tr><td>[SWEEP]</td><td></td><td></td><td></td><td></td></tr>
<tr><td><AUTO></td><td>AUTO</td><td>Starts an auto sweep.</td><td rowspan="5">SWEEP?</td><td rowspan="5">Output of measurement status<table><tr><th>Status</th><th>Output</th></tr><tr><td>STOP</td><td>0</td></tr><tr><td>SINGLE</td><td>1</td></tr><tr><td>REPEAT</td><td>2</td></tr><tr><td>AUTO</td><td>3</td></tr><tr><td>SEGMENT MEASURE</td><td>4</td></tr></table></td></tr>
<tr><td><REPEAT></td><td>RPT</td><td>Starts a repeat sweep.</td></tr>
<tr><td><SINGLE></td><td>SGL</td><td>Starts a single sweep.</td></tr>
<tr><td><SEGMENT MEASURE></td><td>SMEAS</td><td>Measures according to the set sampling count.</td></tr>
<tr><td><STOP></td><td>STP</td><td>Stops a sweep.</td></tr>
<tr><td><SEG POINT****></td><td>SEGP****</td><td>Sets the sampling count for measurement by SEGMENT MEASURE.
****: 1 to 1001 (1 step)</td><td>SEGP?</td><td>1 to 1001</td></tr>
<tr><td><SWEEP MKR L1-L2></td><td>SWPM*</td><td>Selects ON or OFF for the marker-to-marker sweep function.
ON...*: 1 OFF....*: 0</td><td>SWPM?</td><td>ON: 1, OFF: 0</td></tr>
<tr><td><SWP INTVL*****sec></td><td>SWPI*****</td><td>Sets the time from a start of a sweep till a start of the next sweep in the repeat sweep mode.
(Unit: sec)
*****: 0 to 99999(1 step)   0 = MINIMUM</td><td>SWPI?</td><td>0 to 99999</td></tr>
</table>

Table 9-2 GP-IB Program Codes (2/31)

Function	Control command	Explanation	Talker command	Talker output data format
[CENTER]				
<CENTER****.**nm>	CTRWL****.**	Sets the center wavelength (Unit: nm) ****.**: 350.00 to 1750.00 (0.01 step)	CTRWL?	350.00 to 1750.00
<START WL****.**nm>	STAWL****.**	Sets the measurement start wavelength. (Unit: nm) ****.**: −400.00 to 1750.00 (0.01 step)	STAWL?	−400.00 to 1750.00
<STOP WL****.**nm>	STPWL****.**	Sets the measurement end wavelength. (Unit: nm) ****.**: 350.00 to 2500.00 (0.01 step)	STPWL?	350.00 to 2500.00
<PEAK→CENTER>	CTR=P	Sets the waveform peak to the center wavelength.	None	
<AUTO CENTER>	ATCTR*	Selects ON or OFF for the peak-center function at each sweep. PEAK→CENTER ON....*: 1 OFF....*: 0	ATCTR?	ON: 1, OFF: 0
[SPAN]				
<SPAN****.*nm>	SPAN****.*	Sets the span. (Unit: nm) ****.*: 0, 1.0 to 1500.0 (0.1 step)	SPAN?	0, 1.0 to 1500.0
<Δλ→SPAN>	SPN=W	Sets the span according to the spectral width.	None	
<0 nm SWEEP TIME**S>	ZSWPT**	Measurement time from the left end of the screen to the right end at a sweep with a span of 0 nm. (Unit: sec) **: 0 to 50 (1 step) 0 = MINIMUM	ZSWPT?	0 to 50

Table 9-[illegible] GP-IB [illegible] Codes ([illegible])

Function	Control command	Explanation	Talker request	Talker output data format
[LEVEL]				
<REF LEVEL>	REFL ***.*	Sets the reference level (in LOG) (Unit: dBm) ***.*: [illegible] to [illegible] (0.1 step)	REFL?	[illegible] to [illegible]
	REFLP*.**	Sets the reference level (in linear) (Unit: pW) *.**: 1.00 to 9.99 (0.01 step) 10.0 to 99.9 (0.1 step) 100 to 999 (1 step)		PW 1.00 to 999
	REFLN*.**	Sets the reference level (in linear) (Unit: nW) *.**: 1.00 to 9.99 (0.01 step) 10.0 to 99.9 (0.1 step) 100 to 999 (1 step)		NW 1.00 to 999
	REFLU*.**	Sets the reference level (in linear) (Unit: µW) *.**: 1.00 to 9.99 (0.01 step) 10.0 to 99.9 (0.1 step) 100 to 999 (1 step)		UW 1.00 to 999
	REFLM*.**	Sets the reference level (in linear) (Unit: mW) *.**: 1.00 to 9.99 (0.01 step) 10.0 to 100 (0.1 step)		MW 1.00 to 100
<LVL SCALE**.**dB/D>	LSCL **.*	Sets the scale of the level axis **.*: 0.1 to 10.0 (0.1 step, Unit: dB/DIV) or LIN (linear scale)	LSCL?	**.*: 0.1 to 10.0 and LIN, 0 is output
<BASE LVL***.*mW>	BASL ***.*	Sets the bottom scale value in Linear Scale mode ***.*: 0 to REF LEVEL × 0.9	BASL?	PW 1.00 to 999 NW 1.00 to 999 UW 1.00 to 999 MW 1.00 to 999
<PEAK→REF LEVEL>	REF→P	Sets the peak level to the reference level	None	
<AUTO REF LEVEL>	ATREF*	Selects ON or OFF for the PEAK→REF LEVEL function to be executed at each sweep ON ...*: 1 OFF....*: 0	ATREF?	ON: 1, OFF: 0

Table 9-2 GP-IB Program Codes (4/31)

Function	Control command	Explanation	Talker command	Talker output data format
[LEVEL]				
<dBm dBm/nm>	LSUNT*	Switches the level axis scale display between "dBm(W)" and "dBm/nm" (or "W/nm"). dBm(W) ....*: 0 dBm/nm (W/nm) ....*: 1	LSUNT?	dBm(W): 0 dBm/nm(W/nm): 1
<SUBLOG**.*dBD>	SLOG**.*	Sets the subscale (at LOG) **.*: 0.1 to 10.0 (0.1 step)	SLOG?	0.1 to 10.0
<SUB LIN*.***D>	SLIN*.***	Sets the subscale (at LINEAR) *.***:0.005 to 1.250 (0.005 step)	SLIN?	0.005 to 1.250
<SUB SCALE**.*dB/km>	SKM**.*	Sets the subscale to "dB/km". **.*: 0.1 to 10.0 (0.1 step)	SKM?	0.1 to 10.0
<SUB SCALE***.*%/D>	SPS***.*	Sets the subscale to "%/D". ***.*: 0.5 to 125.0 (0.1 step)	SPC?	0.5 to 125.0
<OFST LVL***.*dB>	LOFST***.*	Sets the offset level of the scale. (Unit: dB) ***.*: -99.9 to 99.9 (0.1 step)	LOFST?	−99.9 to 99.9
<OFST LVL***.*dB/km>	LOFSKM***.*	Sets an offset of subscale. (in dB/km) ***.*: −99.9 to 99.9 (0.1 step)	LOFSKM?	−99.9 to 99.9
<SCALE MIN***.*>	SMIN***.*	Sets the bottom scale value in Linear subscale mode. ***.*: 0 to (/DIV) × 10	SMIN?	0 to 12.5
<SCALE MIN***.*%>	SMINP***.*	Sets the bottom scale value in "%" subscale mode. ***.*: 0 to (/DIV) × 10	SMINP?	0 to 1250
<LENGTH**.***km>	LNGT**.***	Sets an optical fiber length. **.***: 0.001 to 99.999 (0.001 step)	LNGT?	0.001 to 99.999
<AUTO SUBSCALE>	ATSCL*	Selects ON or OFF for the auto scaling display function ON....*: 1 OFF....*: 0	ATSCL?	ON: 1, OFF: 0

Table 9-2 GP-IB Program Codes (5/31)

Function	Control command	Explanation	Talker command	Talker output data format
[SETUP]				
<RESOLN**.**nm>	RESLN**.**	Sets the resolution. (Unit: nm) **.*: 0.05 to 10.0 (1-2-5 steps)	RESLN?	0.05 to 10.0
<SENS>		Sets the measuring sensitivity.	SENS?	
SENS NORM RANGE HOLD	SNHD			Output of measuring sensitivity Measuring sensitivity: Output SENS HIGH1: 1 SENS HIGH2: 2 SENS HIGH3: 3 SENS NORM RANG HOLD: 4 SENS NORM RANG AUTO: 5
SENS NORM RANGE AUTO	SNAT			
SENS HIGH1	SHI1			
SENS HIGH2	SHI2			
SENS HIGH3	SHI3			
<AVERAGE TIMES****>	AVG****	Sets the number of averaging times for measurement. ****: 1 to 1000 (1 step)	AVG?	1 to 1000
<SAMPLING PT****>	SMPL****	Sets the sampling point for measurement. ****: 11 to 1001 (1 step)	SMPL?	11 to 1001

Table 9-2 GP-IB Program Codes (6/31)

<table>
<tr><th>Function</th><th>Control command</th><th>Explanation</th><th>Talker command</th><th>Talker output data format</th></tr>
<tr><td>[SETUP]</td><td></td><td></td><td></td><td></td></tr>
<tr><td><CW LIGHT MEASURE></td><td>CLMES</td><td>Sets the CW light measurement mode.</td><td rowspan="2">CWPLS?</td><td rowspan="2"><table><tr><th>Measurement mode</th><th>Output</th></tr><tr><td>PULSE light measurement mode</td><td>0</td></tr><tr><td>CW light measurement mode</td><td>1</td></tr></table></td></tr>
<tr><td><PLS LIGHT MEASURE></td><td>PLMES</td><td>Sets the PULSE light measurement mode.</td></tr>
<tr><td><LPF MODE></td><td>LPF</td><td>Mode for measuring chop light by using a lowpass filter.</td><td rowspan="3">PLMOD?</td><td rowspan="3"><table><tr><th>Measurement mode</th><th>Output</th></tr><tr><td>LPF MODE</td><td>0</td></tr><tr><td>EXT TRG MODE</td><td>1</td></tr><tr><td>PEAK HOLD MODE</td><td>2 + hold time</td></tr></table></td></tr>
<tr><td><PEAK HOLD MODE></td><td>PKHLD****</td><td>Mode for measuring chop light by using the peak hold method.
****[hold time (Unit: ms)]: 1 to 9999 (1 step)</td></tr>
<tr><td><EXT TRG MODE></td><td>EXTRG</td><td>Mode for measuring chop light by an external trigger signal.</td></tr>
<tr><td><MONOCHRO SGL DBL></td><td>MONO*</td><td>Selects single or double for the monochromater.
SGL (single)....*: 0 DBL (double)....*: 1</td><td>MONO?</td><td>SGL: 0, DBL: 1</td></tr>
<tr><td><CHOP INT EXT></td><td>CHOP*</td><td>Selects internal or external for chopping operation.
INT (internal)....*: 0 EXT (external)....*: 1</td><td>CHOP?</td><td>INT: 0, EXT: 1</td></tr>
</table>

Table 9-2 GP-IB Program Codes (7/31)

Function	Control command	Explanation	Talker command	Talker output data format
[MARKER]				
<MARKER>	WMKR****.***	Sets the moving marker to the specified wavelength position. (Unit: nm) ****.***: −400.000 to 2500.000	MKR?	Output of the wavelength (or frequency) and level at the moving marker position.
	FMKR****.***	Sets the moving marker to the specified frequency position. (Unit: THz) ****.***: 110.0000 to 9999.9990		
<MARKER→CENTER>	CTR=M	Sets the wavelength of the moving marker to the center wavelength.	None	
<MARKER->REF LEVEL>	REF=M	Sets the level of the moving marker to the reference level.	None	
<SET MARKER1>	MKR1	Sets the moving marker to the fixed marker 1.	MKR1?	Output of the wavelength and level at the fixed marker 1.
<SET MARKER2>	MKR2	Sets the moving marker to the fixed marker 2.	MKR2?	Output of the wavelength and level at the fixed marker 2.
<MARKER CLEAR>	MKCL	Clears the moving marker, fixed markers and the marker values in the data area.	None	
<MKR UNIT nm THz>	MKUNT*	Sets the unit of marker values. nm....*: 0 THz....*: 1	MKUNT?	nm: 0, THz: 1
<LINE MARKER1>	L1MK****.***	Sets the wavelength line marker 1. (Unit: nm) ****.***: −400.000 to 2500.000	L1MK?	As per Table 9-4 Output Data Format.
	L1FMK****.****	Sets the wavelength line marker 1. (Unit: THz) ****.****: 110.0000 to 9999.9990		
<LINE MARKER2>	L2MK****.***	Sets the wavelength line marker 2. (Unit: nm) ****.***: −400.000 to 2500.000	L2MK?	As per Table 9-4 Output Data Format.
	L2FMK****.****	Sets the wavelength line marker 2. (Unit: THz) ****.****: 110.0000 to 9999.9990		

Table 9-2 GP-IB Program Codes (8/31)

Function	Control command	Explanation	Talker command	Talker output data format
[MARKER]				
<LINE MARKER3>		Sets the level line marker 3.	L3MK?	As per Table 9-4 Output Data Format.
LOG scale	L3DBM****.**	****.**: −150.00 to 40.00 (dBm)		
SUBLOG scale	L3DB****.**	****.**: −139.90 to 139.90 (dB)		
LIN scale	L3LN*.***E±**	*.***E±**: 0 to 1.360E±02		
<LINE MARKER4>		Sets the level line marker 4.	L4MK?	
LOG scale	L4DBM****.**	****.**: −150.00 to 40.00 (dBm)		
SUBLOG scale	L4DB****.**	****.**: −139.90 to 139.90 (dB)		
LIN scale	L4LN*.***E±**	*.***E±**: 0 to 1.360E±02		
<MKRL1-L2→SPAN>	SP=LM	Sets the L1-L2 section to the sweep range.	None	
<SEARCH L1-L2>	SRLMK*	Sets whether or not to execute peak value detection between L1 and L2. ON....*: 1 OFF....*: 0	SRLMK?	ON: 1, OFF: 0
<LINE MKR CLEAR>	LMKCL	Clears the line markers and line marker values.	None	
[PEAK SEARCH]				
<PEAK SEARCH>	PKSR	Detects the MAX value of level.	PKSR?	Output BOTTOM 0 PEAK 1
<BOTTOM SEARCH>	BTSR	Detects the MIN value of level.		
<NEXT SEARCH>	NSR	Detects the next largest value (or next smallest value)	None	
<NEXT SRCH RIGHT>	NSRR	Detects the largest value (or smallest value) on the right side of the moving marker.	None	
<NEXT SRCH LEFT>	MSRL	Detects the largest value (or smallest value) on the left side of the moving marker.	None	
<AUTO SEARCH>	ATSR*	Selects ON or OFF for the automatic detection of the peak/bottom function. ON....*: 1 OFF....*: 0	ATSR?	ON: 1, OFF: 0
<MODE DIFF**.**dB>	MODIF**.**	Sets the level difference for mode judgment. (Unit: dB) **.**: 0 to 50.00 (0.01 step)	MODIF?	0 to 50.00

Table 9-2 GP-IB Program Codes (9/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ANALYSYS]				
<SPEC WD*********>	SW*	Measures the spectrum width. ENVELOPE *: 0, THRESH *: 1, RMS *: 2, PEAK RMS *: 3, NOTCH *: 4	SW?	ENVELOPE: 0, THRESH: 1, RMS: 2, PEAK RMS: 3, NOTCH: 4
(ENVELOPE)	SWENV	Measures the spectrum width in Envelope method.	None	
<ENV TH1**.*dB>	ENVT1**.*	Sets a threshold (in dB) for spectrum width search in Envelope method. **.*: 0.1 to 10.0 (0.1 step)	ENVT1?	0.1 to 10.0
<ENV TH2**.*dB>	ENVT2**.*	Sets a truncation limit for spectrum width search in Envelope method. **.*: 0.1 to 30.0 (0.1 step)	ENVT2?	0.1 to 30.0
<ENV K**.**>	ENVK**.**	Sets a magnification ratio for spectrum width search in Envelope method. **.**: 1.00 to 10.00 (0.01 step)	ENVK?	1.00 to 10.00
(THRESH)	SWTHR	Measures the spectrum width in Threshold method.	None	
<THRESH TH**.*dB>	THRTH**.*	Sets a threshold (in dB) for spectrum width search in Threshold method. **.**: 0.1 to 50.0 (0.1 step)	THRTH?	0.1 to 50.0
<THRESH K**.**>	THRK**.**	Sets a magnification ratio for spectrum width search in Threshold method. **.**: 1.00 to 10.00 (0.01 step)	THRK?	1.00 to 10.00
<MODE FIT>	MODFT*	During spectrum width search in Threshold method (with the 1-time magnification): "1": Sets the marker to the peak of selected mode. "2": Sets the marker to the matching position of threshold level.	MODFT?	"1": Sets the marker to the mode peak. "0": Sets the marker to the matching position of threshold level.

Table 9-2 GP-IB Program Codes (10/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ANALYSYS]				
<SPEC WD*********>				
(RMS)	SWRMS	Measures the spectrum width in RMS method.	None	
<RMS TH**.*dB>	RMSTH**.*	Sets a truncation limit (in dB) for spectrum width search in RMS method. **.*: 0.1 to 30.0 (0.1 step)	RMSTH?	0.1 to 30.0
<RMS K**.**>	RMSK**.**	Sets a magnification ratio for spectrum width search in RMS method. **.**: 1.00 to 10.00 (0.01 step)	RMSK?	1.00 to 10.00
(EAK RMS)	SWPRM	Measures the spectrum width in Peak RMS method.		
<PK RMS**.*dB>	PRMTH**.*	Sets a truncation limit (in dB) for spectrum width search in Peak RMS method. **.*: 0.1 to 30.0 (0.1 step)	PRMTH?	0.1 to 30.0
<PK RMS K**.**>	PRMK**.**	Sets a magnification ratio for spectrum width search in Peak RMS method. **.**: 1.00 to 10.00 (0.01 step)	PRMK?	1.00 to 10.00
(NOTCH)	SWNCH	Measures the notch width.	None	
<NOTCH TH**.*dB>	NCHTH**.*	Sets a threshold (in dB) for notch width measurement. **.*: 0.1 to 50.0 (0.1 step)	NCHTH?	0.1 to 50.0
<ANALYSIS1*********>		Analyzes the parameters required for side mode suppress ratio, power measurement, and LD and LED indication.		
(SMSR)			None	
<SMSR*>	SMSR*	Sets the reference to measure the side mode suppress ratio. *: 1, 2	SMSR?	1, 2
<SMSR MASK ±**.**nm>	SSMSK**.**	Sets the mask range (in nm) close to the peak during SMSR1 measurement. **.**: 0 to 99.99 (0.01 step)	SSMSK?	0 to 99.99

Table 9-2 GP-IB Program Codes (11/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ANALYSYS]				
<ANALYSIS1*********>				
(POWER)	PWR	Measures the marker-to-marker power.	None	
<PWR OFST**.**dB>	POFS**.**	Sets a compensation value (in dB) for marker-to-marker measurement. **.**: −10.00 to 10.00 (0.01 step)	POFS?	−10.00 to 10.00
(FP-LD) (See Table A1.)	FPAN	Analyzes the Fabry-Peror laser diode.	None	
(DFB-LD) (See Table A1.)	DFBAN	Analyzes the DFB laser diode.	None	
(LED) (See Table A1.)	LEDAN	Analyzes the light emitting diode (LED).	None	
<ANALYSIS2*********>		Executes NF calculation, color analysis, and WDM analysis.		
(COLOR)	COLAN	Analyzes the colors.	None	
(EDFA NF)	EDNF	Calculates the noise figure (NF).	None	
<OFST(IN)***.**dB>	OFIN***.**	Sets an offset of signal light (in dB). ***.**: −99.99 to 99.99 (0.01 step)	OFIN?	−99.99 to 99.99
<OFST(OUT) ***.**dB>	OFOUT***.**	Sets an offset of output light (in dB). ***.**: −99.99 to 99.99 (0.01 step)	OFOUT?	−99.99 to 99.99
<PLUS MSK**.**nm>	PLMSK**.**	Sets a mask range right to peak waveforms. **.**: 0 to 10.00 (0.01 step)	PLMSK?	0 to 10.00
<MINUS MSK **.** nm>	MIMSK**.**	Sets a mask range left to peak waveforms. **.**: 0 to 10.00 (0.01 step)	MIMSK?	0 to 10.00

Table 9-2 GP-IB Program Codes (12/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ANALYSYS]				
<ANALYSIS2*********>				
(EDFA NF)	EDNF	Calculates the noise figure (NF).	None	
<CVFT TYPE *********>	EDFCVF*	Sets the following curve fit types for NF calculation: | | * | GAUSSIAN | 0 LORENZIAN | 1 3RD POLY | 2 4TH POLY | 3 5TH POLY | 4	EDFCVF?	| | Output | GAUSSIAN | 0 LORENZIAN | 1 3RD POLY | 2 4TH POLY | 3 5TH POLY | 4
<CVFT THR**.*dB>	EDFTH**.*	Sets a threshold for curve fitting (in dB). **.*: 0.1 to 99.9 (0.1 step)	EDFTH?	0.1 to 99.9
(WDM)	WDMAN	Analyzes the WDM.	None	
<OFFSET SPACING>	WDMOS*	Selects the display items on the WDM list. OFFSET *: 0, SPACING *: 1	WDMOS?	0: OFFSET, 1: SPACING
<REF CHNEL HIGHEST>	WDMRH	Sets the reference at the highest channel peak.	None	
<REF CHNEL ****.**nm>	WDMRW****.**	Sets the reference at the channel peak closest to the setup wavelength (in nm). ****.**: 350.00 to 1750.00 (0.01 step)	WDMRW?	350.00 to 1750.00
<REF CHNEL NO.***>	WDMRN***	Sets the reference at the "n-th" channel peak specified. ***: 1 to 99 (1 step)	WDMRN?	1 to 99
<THRESH**.*dB>	WDMTH**.*	Sets a threshold of channel peak (in dB). **.*: 0.1 to 50.0 (0.1 step)	WDMTH?	0.1 to 50.0
<MAX NUM***>	WDMMAX***	Sets the maximum channel peak. ***: 1 to 99 (1 step)	WDMMAX?	1 to 99
<MODE DIFF**.dB>	WDMIF**.*	Sets the minimum difference between top and bottom of waveforms (in dB) for channel peak detection. **.*: 0.0 to 50.0 (0.1 step)	WDMDIF?	0.0 to 50.0

Table 9-2 GP-IB Program Codes (13/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ANALYSYS]				
<AUTO ANALYSIS>	ATANA*	Automatically executes the selected function after sweep. ON *: 1 OFF *: 0	ATANA?	ON: 1, OFF: 0

Table A1. FP-LD, DFB-LD, and LED ANALYSIS Parameter Setup Commands (Parameter Setup Window)

Function	Control command	Explanation
<PARAMETER (FP-LD)>	FPLD○; □; △;****	Sets the parameters in the FP-LD ANALYSIS window. ○ - 0: SPEC WIDTH, 1: MEAN WL, 2: TOTAL POWER, 3: MODE NO. □ - 0: ENV, 1: THRESH, 2: RMS, 3: PK RMS, 4: POWER △ - 0: TH1, 1: TH2, 2: K, 3: MODE FIT, 4: MODE DIFF, 5: OFST LEVEL **** : Set value
<PARAMETER (DFB-LD)>	DFBLD○; □; △;****	Sets the parameters in the DFB-LD ANALYSIS window. ○ - 0: −XdB WIDTH, 1: SMSR □ - 0: ENV, 1: THRESH, 2: RMS, 3: PK RMS, 4: SMSR1, 5: SMSR2 △ - 0: TH, 1: TH2, 2: K, 3: MODE FIT, 4: MODE DIFF, 5: SMSR MASK **** : Set value
<PARAMETER (LED)>	LED○; □; △;****	Sets the parameters in the LED ANALYSIS window. ○ - 0: SPEC WIDTH, 1: MEAN WL, 2: TOTAL POWER □ - 0: ENV, 1: THRESH, 2: RMS, 3: PK RMS, 4: POWER △ - 0: TH1, 1: TH2, 2: K, 3: MODE FIT, 4: MODE DIFF, 5: OFST LEVEL **** : Set value

Table 9-2 GP-IB Program Codes (15/31)

Function	Control command	Explanation	Talker command	Talker output data format
[TRACE]				
<WRITE A>	WRTA	Sets the trace A write mode.	TRA?	Output WRITE 0 FIX 1 MAX HLD 2 ROL AVG 3 + number of AVG times
<FIX A>	FIXA	Sets the trace A fixed data mode.		
<MAX HOLD A>	MAXA	Sets the trace A MAX value detection mode.		
<ROLL AVG A***>	RAVA***	Trace A sequential addition mode. *** (number of AVG times): 2 to 100 (1 step)		
<DISPLAY A>	DSPA	Selects display or non-display for trace A.	DSPA?	Output BLANK 0 DISP 1
<BLANK A>	BLKA			
<ACTIVE TRACE*>	ACTV*	Active trace selection * Trace A 0 Trace B 1 Trace C 2	ACTV?	Output Trace A 0 Trace B 1 Trace C 2
<WRITE B>	WRTB	Sets the trace B write mode.	TRB?	Output WRITE 0 FIX 1 MIN HLD 2 ROL AVG 3 + number of AVG times
<FIX B>	FIXB	Sets the trace B fixed data mode.		
<MIN HOLD B>	MINB	Sets the trace B MIN value detection mode.		
<ROLL AVG B***>	RAVB***	Sets the trace B sequential addition mode. *** (number of AVG times): 2 to 100 (1 step)		

Table 9-2 GP-IB Program Codes (16/31)

Function	Control command	Explanation	Talker command	Talker output data format
[TRACE]				
<DISPLAY B>	DSPB	Selection display or non-display for trace B.	DSPB?	Output BLANK 0 DISP 1
<BLANK B>	BLKB			
<WRITE C>	WRTC	Sets the trace C write mode.	TRC?	Output WRITE 0 FIX 1 A-B 2 B-A 3 A-B (LIN) 4 B-A (LIN) 5 A+B (LIN) 6 NORMALIZE 7 DOMINANT 8 CURVE FIT 10 + limit value CURVE FIT PK 110 + limit value
<FIX C>	FIXC	Sets the trace C fixed data mode.		
<CALCULATE C>				
<A-B→C>	A-BC	Copies the result obtained by subtracing trace B from trace A to the trace C. (LOG value calculation)		
<B-A→C>	B-AC	Copies the result obtained by subtracing trace A from trace B to the trace C. (LOG value calculation)		
<A-B(LIN)→C>	A-BCL	Copies the result obtained by subtracing trace B from trace A and to the trace C. (Linear value calculation)		
<B-A(LIN)→C>	B-ACL	Copies the result obtained by subtracing trace A from trace B to the trace C. (Linear value calculation)		
<A+B(LIN)→C>	A+BCL	Copies sum of trace A and trace B to trace C. (Linear value calculation)		

Table 9-2 GP-IB Program Codes (17/31)

Function	Control command	Explanation	Talker command	Talker output data format
[TRACE]				
<EFECT C>				
<NORMALIZE C>	NORMC	Displays the data of trace C in normalized form.	TRC?	See previous page.
<DOMINANT C>	DOMIC	Displays the data of trace C in normalized form after spectral luminous efficacy compensation.		
<CURVE FIT C**dB>	CVFTC**	Displays all the data of trace C after curve fit processing. (Unit: dB) **: 0 to 99 (1 step)		
<CURVE FIT PK C**dB>	CVPKC**	Displays only the data of the mode peak point on trace C after curve fit processing. (Unit: dB) **: 0 to 99 (1 step)		
<DISPLAY C>	DSPC	Selects dislay or non-display for trace C.	DSPC?	Output BLANK 0 DISP 1
<BLANK C>	BLKC			
<TRACE A→B>	B=A	Copies the trace A to the trace B.	None	
<TRACE A→C>	C=A	Copies the trace A to the trace C.	None	
<TRACE B→A>	A=B	Copies the trace B to the trace A.	None	
<TRACE B→C>	C=B	Copies the trace B to the trace C.	None	
<TRACE C→A>	A=C	Copies the trace C to the trace A.	None	
<TRACE C→B>	B=C	Copies the trace C to the trace B.	None	

Table 9-2 GP-IB Program Codes (18/31)

Function	Control command	Explanation	Talker command	Talker output data format
[DISPLAY]				
<NORMAL DISPLAY>	NORMD	Sets the scren to the ordinary display mode.	DISP?	Output <NORMAL> 0 <SPLIT> 1 <3D> 2
<SPLIT DISPLAY>	SPLIT	Sets the screen to the 2-split display mode.		
<TRACE A UP LOW>	ULTRA*	Sets the upper and lower sides of 2-split display for trace A. UP....*: 1 LOW....*: 0	ULTRA?	UP: 1, LOW: 0
<TRACE B UP LOW>	ULTRB*	Sets the upper and lower sides of 2-split display for trace B. UP....*: 1 LOW....*: 0	ULTRB?	
<TRACE C UP LOW>	ULTRC*	Sets the upper and lower sides of 2-split display for trace C. UP....*: 1 LOW....*: 0	ULTRC?	
<UPPER HOLD>	UHLD*	Fixes the scale after changing the upper-side trace of 2-split display to FIX. ON....*: 1 OFF....*: 0	UHLD?	ON: 1, OFF: 0
<LOWER HOLD>	LHLD*	Fixes the scale after changing the lower-side trace of 2-split display to FIX. ON....*: 1 OFF....*: 0	LHLD?	

Table 9-2 GP-IB Program Codes (19/31)

Function	Control command	Explanation	Talker command	Talker output data format
[DISPLAY]				
<3D DISPLAY>	3D	Sets the screen to the 3-dimensional display mode.	DISP?	
<ANGLE***deg>	ANGLE**	Sets the angle of 3-dimensional display. (Unit: deg) ***: −50 to 50 (10 steps)	ANGL?	−50 to 50
<RECALL>	3DRCL	Redisplays the waveform group cleared in the 3-dimensional display mode.	None	
<Z-SCALE**>	ZSCL**	Sets the number of waveforms in the 3-dimensional display mode. **: 3 to 16 (1 step)	ZSCL?	3 to 16
<MEMORY 1st 2nd>	MEM*	Sets the memory for 3-dimensional display. 1st....*: 0 2nd....*: 1	MEM?	1st: 0, 2nd: 1
<LABEL>	LBL'***...***'	Sets the label input mode. ***...***: Character string (50 max.)	LBL?	Character string on display
<ALL CLEAR>	LBLCL	Clears all the chracter strings in the label input area.	None	
<NOISE MSK****dBm>	NMSK****	Displays the waveforms below the set value in masked form. (Unit: dBm) ****: 0 to −100 (1step) OFF: −999	NMSK?	0 to −100 OFF: −999
<GRAPH CLEAR>	CLR	Clears then trace A, B and C.	None	

Table 9-2 GP-IB Program Codes (20/31)

Function	Control command	Explanation	Talker command	Talker output data format
[MEMORY]				
<SAVE>				
<SAVE A→MEM>	SAVEA**	Saves the trace A into memory. ** (memory address): 0 to 31 (1 step)	None	
<SAVE B→MEM>	SAVEB**	Saves the trace B into memory. ** (memory address): 0 to 31 (1 step)	None	
<SAVE C→MEM>	SAVEC**	Saves the trace C into memory. ** (memory address): 0 to 31 (1 step)	None	
<RECALL>				
<RECALL MEM→A>	RCLA**	Recalls the contents of memory to the trace A. ** (memory address): 0 to 31 (1 step)	None	
<RECALL MEM→B>	RCLB**	Recalls the contents of memory to the trace B. ** (memory address): 0 to 31 (1 step)	None	
<RECALL MEM→C>	RCLC**	Recalls the contents of memory to the trace C. ** (memory address): 0 to 31 (1 step)	None	

Table 9-2 GP-IB Program Codes (21/31)

Function	Control command	Explanation	Talker command	Talker output data format
[FLOPPY]				
<WRITE>				
<TRACE RD/WRT>				
<ABC→FD>	WR* '@@@@@@@@'	Records one of trace A, B and C to FD. *: A(trace A), B(trace B) or C(trace C) @-@: File name When the underlined part is omitted, the default file name is set.	None	
<MEMORY→FD>	WRMEM** '@@@@@@@@'	Records the contents of memory into FD. **(memory address): 0 to 31 (1 step) @-@: File name When the underlined part is omitted, the default file name is set.	None	
<3D→FD 1st 2nd>	WR3D* '@@@@@@@@'	Records the waveform group in the 3-dimensional display mode into FD. *: F(1st) or S(2nd) @-@: File name When the underlined part is omitted, the default file name is set.	None	
<BIN TXT BIN+ASC>	TRFMT*	Selects a record format. BINARY...*: 0 BINARY+ASCII...*: 1 TEXT...*: 2	TRFMT?	BINARY:0, BIN+ASC: 1, TXT: 2
<PROGRAM RD/WRT>	WRPRG** '@@@@@@@@'	Records a program to FD. **: 1 to 20 (1 step) @-@: File name When the underlined part is omitted, the default file name is set.	None	

Table 9-2 GP-IB Program Codes (22/31)

Function	Control command	Explanation	Talker command	Talker output data format
[FLOPPY]				
<WRITE>				
<DATA RD/WRT>	WRDT '@@@@@@@@'	Records data into FD. @-@: File name When the underlined part is omitted, the default file name is set.	None	
<DATA & TIME>	D&TDT*	Records the date and time into FD. ON...*: 1 OFF...*: 0	D&TDT?	ON: 1, OFF: 0
<LABEL>	LBLDT*	Records a label into FD. ON...*: 1 OFF...*: 0	LBLDT?	ON: 1, OFF: 0
<DATA AREA>	DTARA*	Records data into FD. ON...*: 1 OFF...*: 0	DTARA?	ON: 1, OFF: 0
<CONDITION>	CNDDT*	Records setting conditions into FD. ON...*: 1 OFF...*: 0	CNDDT?	ON: 1, OFF: 0
<ADD WRITE OVERWRITE>	DTAD*	Adds or overwrites a data file. ADD WRITE...*: 0, OVERWITE...*: 1	DTAD?	0: ADD WRITE, 1: OVERWRITE
<GRPH RD/WRT>	WRGR '@@@@@@@@'	Saves a graphic file on an FD. @-@: File name The default file name is used if under lined parameter is omitted.	None	
<B&W> <PRESET COLOR> <SCREEN COLOR>	GRCOL*	Selects a graphic file color. B&W...*: 0, PRESET COLOR...*: 1, SCREEN COLOR...*: 2	GRCOL?	0: B&W, 1: PRESET COLOR 2: SCREEN COLOR
<BMP TIFF>	GRFMT*	Selects a graphic file format. BMT...*: 0, TIFF...*: 1	GRFMT?	0: BMP, 1: TIFF
<SETTING RD/WRT>	WRSET '@@@@@@@@'	Records system information into FD. @-@: File name The default file name is used if under lined parameter is omitted.	None	

Table 9-2 GP-IB Program Codes (23/31)

Function	Control command	Explanation	Talker command	Talker output data format
[FLOPPY]				
<READ>				
<TRACE RD/WRT>				
<FD→ABC>	RD* '@@@@@@@@'	Reads the data of FD into the set trace. *: A(trace A), B(trace B) or C(trace C) @-@: File name	None	
<FD→MEMORY>	RDMEM** '@@@@@@@@'	Reads the data of FD into memory. **(memory address): 0 to 31 (1 step) @-@: File name	None	
<FD→3D 1st 2nd>	RD3D* '@@@@@@@@'	Reads the waveform group in the 3-dimensional display from FD. *: F(1st) or S(2nd) @-@: File name	None	
<PROGRAM RD/WRT>	RDPRG** '@@@@@@@@'	Reads a program from FD. **: 1 to 20 (1 step) @-@: File name	None	
<DATA RD/WRT>	RDDT '@@@@@@@@'	Reads data from FD. @-@: File name	None	
<SETTING RD/WRT>	RDSET '@@@@@@@@'	Reads system information from FD. @-@: File name ***: Extension	None	
<DIRECTORY>				
DELETE	DEL '@@@@@@@@ ***'	Deletes the file stored in FD. @-@: File name	None	
<DISK INITIALIZE>	DSKIN*.**	Initializes FD. (Unit: Mbyte) *.**: 1.2 or 1.44	None	

Table 9-2 GP-IB Program Codes (24/31)

Function	Control command	Explanation	Talker command	Talker output data format
[PROGRAM]				
<PROGRAM EXECUTE>	EXEC**	Executes a program. ** (program file No.): 1 to 20	EXEC?	Run status: 1 Stop status: 0
<PROGRAM EXIT>	PREXT	Causes a program to pause.	None	
<DELETE>	PRDEL**	Deletes a program. ** (program file No.): 1 to 20	None	
[SYSTEM]				
<COPY KEY PTR PLTR>	CPKY*	Selects a device for screen hard copy. PTR (printer)...*: 0 PLTR (plotter)...*: 1	CPKY?	Printer:0, Plotter: 1
<COPY CONFIG>				
<PLOT TRACE>	CPTRC*	Puts a waveform into plot processing. ON...*: 1 OFF...*: 0	CPTRC?	ON: 1, OFF: 0
<PLOT SCALE>	CPSCL*	Puts the scales of waveform frame, wavelength axis and level axis into plot processing. ON...*: 1 OFF...*: 0	CPSCL?	ON: 1, OFF: 0
<PLOT GRID>	CPGRD*	Puts the rules into plot processing. ON...*: 1 OFF...*: 0	CPGRD?	ON: 1, OFF: 0
<PLOT CONDITION>	CPCND*	Puts the measuring conditions, trace type, label, date and time into plot processing. ON...*: 1 OFF...*: 0	CPCND?	ON: 1, OFF: 0
<PLOT MARKER>	CPMKR*	Puts the line marker, ▽ marker and data area into plot processing. ON...*: 1 OFF...*: 0	CPMKR?	ON: 1, OFF: 0
<PLOT OTHERS>	CPOTH*	Puts the interrupt display, mark display and soft keys into plot processing. ON...*: 1 OFF...*: 0	CPOTH?	ON: 1, OFF: 0

Table 9-2 GP-IB Program Codes (25/31)

Function	Control command	Explanation	Talker command	Talker output data format
[SYSTEM]				
<COPY CONFIG>				
<PRINTER SAVE SPC>	PTSAV*	Sets the amount of feed after printing. ON...*: 1 OFF...*: 0	PTSAV?	ON: 1, OFF:0
<PLOTTER ADRS**>	PLADR**	Sets the GP-IB address of the plotter. **: 0 to 29 (1 step)	PLADR?	0 to 29
<PEN SEL**>	PNSEL**	Sets the pen number of the plotter. **: 1 to 9 (1 step), AT(AUTO)	PNSEL?	0 to 9 (AUTO=0)
<PLOTTER AUTO FEED>	PLFED*	Selects use or non-use of the auto feed function of the plotter. ON...*: 1 OFF...*: 0	PLFED?	ON: 1, OFF:0
<USER KEY DEFINE>				
{KEY DEF DONE}	KYDNE	Terminates the user key registration mode.	None	
<SET CLOCK>	DATE YR. MO. DY	Set the built-in clock. YR(YEAR): 0 to 99, MO(MONTH): 1 to 12, DY(DAY): 1 to 31,	DATE?	Output of the current YR, MO and DY.
	TIME HH:MM	HH(HOUR): 0 to 23, MM(MINUTE) : 0 to 59	TIME?	Output of the current HH:MM.
<SET COLOR>				
<DEFAULT COLOR*>	DEFCL*	Set the display color. * : 1 to 5 patterns	DEFCL?	1 to 5
<MEAS WL AIR VAC>	MESWL*	Switches measurement wavelength (between air wavelength and vacuum wavelength) When AIR (air wavelength) is selected: 0 When VAC (vacuum wavelength) is selected: 1	MESWL?	AIR: 0, VAC: 1
<WL CAL>	WCAL,****.***	Waveform absolute value calibration (Unit: nm) ****.***: 350.000 to 1750.000 (0.001 step)	WCAL?	350.000 to 1750.000

Table 9-2 GP-IB Program Codes (26/31)

<table>
<tr><th>Function</th><th>Control command</th><th>Explanation</th><th>Talker command</th><th>Talker output data format</th></tr>
<tr><td>[SYSTEM]</td><td></td><td></td><td></td><td></td></tr>
<tr><td><WL SHIFT></td><td>WLSFT**.**</td><td>Sets the amount of waveform shift. (Unit: dB)
***.**: –5.00 to 5.00 (0.01 step)</td><td>WLSFT?</td><td>–5.00 to 5.00</td></tr>
<tr><td><LEVEL SHIFT></td><td>LVSFT***.**</td><td>Sets the amount of level shift. (Unit: dB)
***.**: –30.00 to 30.00 (0.01 step)</td><td>LVSFT?</td><td>–30.00 to 30.00</td></tr>
<tr><td><AUTO OFFSET></td><td>ATOFS*</td><td>Selects ON or OFF for the AMP auto offset function.
ON ... *: 1 OFF ... *: 0</td><td>ATOFS?</td><td>ON:1, OFF:0</td></tr>
<tr><td><BUZZER></td><td></td><td></td><td></td><td></td></tr>
<tr><td><CLICK></td><td>BZCLK*</td><td>Selects use or non-use of a click.
ON ... *:1 OFF ... *:0</td><td>BZCLK?</td><td>ON:1, OFF:0</td></tr>
<tr><td><WARNING></td><td>BZWRN*</td><td>Selects use or non-use of an alarm.
ON ... *:1 OFF ... *:0</td><td>BZWRN?</td><td>ON:1, OFF:0</td></tr>
<tr><td>[ADVANCE]</td><td></td><td></td><td></td><td></td></tr>
<tr><td><POWER METER></td><td></td><td></td><td></td><td></td></tr>
<tr><td><REPEAT></td><td>PMPRT</td><td>Sets repeat measurement.</td><td rowspan="3">PMST?</td><td rowspan="3"><table><tr><th></th><th>Output</th></tr><tr><td>STOP</td><td>0</td></tr><tr><td>SINGLE</td><td>1</td></tr><tr><td>REPEAT</td><td>2</td></tr></table></td></tr>
<tr><td><SINGLE></td><td>PMSGL</td><td>Sets single measurement.</td></tr>
<tr><td><STOP></td><td>PMSTP</td><td>Stops the power meter function.</td></tr>
<tr><td><AREA********></td><td>AREA*</td><td>Sets the measuring range.<table><tr><th></th><th>*</th></tr><tr><td>FULL</td><td>0</td></tr><tr><td>350 to 700 nm</td><td>1</td></tr><tr><td>600 to 1000 nm</td><td>2</td></tr><tr><td>1000 to 1750 nm</td><td>3</td></tr></table></td><td>AREA?</td><td><table><tr><th></th><th>Output</th></tr><tr><td>FULL</td><td>0</td></tr><tr><td>350 to 700 nm</td><td>1</td></tr><tr><td>600 to 1000 nm</td><td>2</td></tr><tr><td>1000 to 1750 nm</td><td>3</td></tr></table></td></tr>
</table>

Table 9-2 GP-IB Program Codes (27/31)

Function	Control command	Explanation	Talker command	Talker output data format
[ADVANCE]				
<POWER METER>				
<RELATIVE>	REL*	Selects absolute value or relative value for display value The relative value is 0 dB at ON ON (relative value)...*: 1 OFF (absolute value)...*: 0	REL?	ON (relative value): 1 OFF (absolute value): 0
<MAX MIN RESET>	PMRST	Sets the maximum value and minimum value	None	
<dBm W>	PMUNT*	Sets the display unit. dBm (LOG value)...*: 0 W (linear value)...*: 1	PMUNT?	dBm: 0, W: 1
<OPTICAL OUTPUT>				
<OUTPUT WL ****.***nm>	OUTWL****.***	Sets the optical output waveform . (Unit: nm) ****.***: 350.000 to 1750.000 (0.001 step)	OUTWL?	350.000 to 1750.000
<OUTPUT BW**.**nm>	OUTBW**.**	Sets the optical output band width (resolution). (Unit: nm) **.**: 0.05 to 10.0 (1-2-5 step)	OUTBW?	0.05 to 10.0
<BM ALIGN****>	BMALN****	Fine adjustment of Y axis position at optical output ****: −200 to 200 (1 step)	BMALN?	−200 to 200

Table 9-2 GP-IB Program Codes (28/31)

② Others

<table>
<tr><th>Function</th><th>Control command</th><th>Explanation</th><th>Talker command</th><th>Talker output data format</th></tr>
<tr><td>[COPY]</td><td>COPY*</td><td>Outputs to the printer/plotter.
ON ... * : 1 OFF ... * : 0</td><td>COPY?</td><td>ON (copy) : 1,
OFF (except copy) : 0</td></tr>
<tr><td>[FEED]</td><td>PRFED**</td><td>Printer paper feed
** : 1 to 10 (Amount of feed, Unit : × 5 mm)</td><td>None</td><td></td></tr>
<tr><td>[HELP]</td><td>HELP*</td><td>ON or OFF for the explanatory statement display.
Display ... * : 1 Clear ... * : 0</td><td>HELP?</td><td>Display : 1
Non-display : 0</td></tr>
<tr><td>[COARSE]</td><td>CRS*</td><td>[COARSE] key of the rotary knob.
ON ... * : 1 OFF ... * : 0</td><td>CRS?</td><td>ON : 1, OFF : 0</td></tr>
<tr><td>Delimiter specification</td><td>SD*</td><td>Specifies the string delimiter.<table><tr><td></td><td>*</td></tr><tr><td>,</td><td>0</td></tr><tr><td>CRLF</td><td>1</td></tr></table></td><td>SD?</td><td><table><tr><td></td><td>Output</td></tr><tr><td>,</td><td>0</td></tr><tr><td>CRLF</td><td>1</td></tr></table></td></tr>
<tr><td></td><td>BD*</td><td>Specifies the block delimiter.<table><tr><td></td><td>*</td></tr><tr><td>CRLF+EOI</td><td>0</td></tr><tr><td>LF+EOI</td><td>1</td></tr></table></td><td>BD?</td><td><table><tr><td></td><td>Output</td></tr><tr><td>CRLF+EOI</td><td>0</td></tr><tr><td>LF+EOI</td><td>1</td></tr></table></td></tr>
<tr><td>SRQ ON/OFF</td><td>SRQ*</td><td>Permission or inhibition of service request.
ON (permission ... * : 1
OFF (inhibition) ... * : 0
Default = "OFF"</td><td>SRQ?</td><td>ON : 1, OFF : 0</td></tr>
<tr><td>SRQ mask function</td><td>SRMSK***</td><td>Sets "1" in the bit to be masked.
*** : 0 to 255</td><td>SRMSK?</td><td>0 to 255</td></tr>
</table>

Table 9-2 GP-IB Program Codes (29/31)

Function	Control command	Explanation	Talker command	Talker output data format
Nonvolatile data initialization	INIT	Initializes data except program/memory.	None	
Talker data header information ON/OFF	HD*	Appends a header to the talker data for the output request command. ON ... * :1 OFF ... * : 0 Default = "OFF"	HD?	ON : 1, OFF : 0
Waveform data output request command	LDATA R****-R****	Trace A level data **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		As per Table 9-4 Output data format.
	LDATB R****-R****	Trace B level data **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		
	LDATC R****-R****	Trace C level data **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		
	LMEM$$ R****-R****	Memory $$ level data $$: 0 to 31 **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		
	WDATA R****-R****	Trace A wavelength data **** : 1 to 1001 R1-R1001 when the underlined part is omitted		

Table 9-2 GP-IB Program Codes (30/31)

Function	Control command	Explanation	Talker command	Talker output data format
Waveform data output request command	WDATB R****-R****	Trace B wavelength data **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		As per Table 9-4 Output data format.
	WDATC R****-R****	Trace C wavelength data **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		
	WMEM$$ R****-R****	Memory $$ wavelength data $$: 0 to 31 **** : 1 to 1001 R1-R1001 when the underlined part is omitted.		
Log data digit count setup command	LDTDIG*	Sets the number of decimal digits during level data (log) output via GPIB port. "2" for two decimal digits immediately after power-on "3" for three decimal digits	LDTDIG?	"2" for two decimal digits "3" for three decimal digits
Trace list/memory list information output request command	ST**?	Requests the list information of trace A, B and C and the list information in memory. ** : A, B, C or 0 to 31 (memory address)		As per Table 9-4 Output data format.
Marker value output request command	MKR?	Requests the moving ▽ marker value.		
	MKR1?	Requests the fixed ▽ marker 1 value.		
	MKR2?	Request the fixed ▽ marker 2 value.		
	L1MK?	Requests the line marker 1 value (wavelength).		
	L2MK?	Requests the line marker 2 value (wavelength).		
	L3MK?	Requests the line marker 3 value (level).		
	L4MK?	Requests the line marker 4 value (level).		
Analysis result output request command	ANA?	Requests the analysis result.		

Table 9-2 GP-IB Program Codes (31/31)

Function	Control command	Explanation	Talker command	Talker output data format
Power meter function measurement result request command	PMTR?	Requests data obtained through power meter function		As per Table 9-4 Output data format.
	MAXP?	Requests MAX power		
	MINP?	Requests MIN power		
FD directory information output request command	DIR?	Outputs the <DIRECTORY> execution result.		
FD-accessed file name output request command	FNAME?	Requests the file name previously read or written.		
Warning error No. output request command	WARN?	Requests the warning error number that lastly occurred.		

9.2.6 Output data

When this equipment is specified as a talker by the controller, the equipment outputs data. It is necessary to specify the contents of output data beforehand by program code.

Table 9-4 shows a list of output data request codes and output data formats.

When the power supply is turned on, the string delimiter for output data (delimiter between data) is set to ",", while the block delimiter (end character of data) is set to CRLF + EOI.

These settings are changeable. Table 9-3 shows delimiter specifying codes.

When the delimiter has been changed, "," and CRLF of the output data formats shown in Table 9-4 are changed into the changed delimiter.

Table 9-3 Delimiter Specifying Codes

Program code	Contents
SD0	Sets the string delimiter to ",".
SD1	Sets the string delimiter to CRLF.
BD0	Sets the block delimiter to CRLF + EOI.
BD1	Sets the block delimiter to LF + EOI.

Table 9-4 Output Data Formats (1/11)

Data output item	Output request command	Talker output data format
Data on LOG scale (dBm, dB/nm, dB/km) Data in trace A Data in trace B Data in trace C Data in memory (LOG scale)	LDATA R****-R**** LDATB R****-R**** LDATC R****-R**** LMEM$$ R****-R**** **** : 1 to 1001 $$: 0 to 31 (memory address)	* (SD) ... String delimiter (BD) ... Block delimiter Space Data continues according to the number of data. (Header) △****(SD)±$\underline{***.**}$(SD)…±$\underline{***.**}$(BD) Number of data (1 to 1001) Data (210.00 to –210.00) (Header)…… Absolute value : "DBM" Relative value : "DB△"
Data on LIN scale (*W, *W/nm, LIN or % subscale) Data in trace A Data in trace B Data in trace C Data in memory (LIN scale)	LDATA R****-R**** LDATB R****-R**** LDATC R****-R**** LMEM$$ R****-R**** **** : 1 to 1001 $$: 0 to 31 (memory address)	* (SD) ... String delimiter (BD) ... Block delimiter Space Data continues according to the number of data. (Header) △****(SD)*.***E±**(SD)…±*.***E±**(BD) Number of data (1 to 1001) Data (1.000E + 21 to 1.000E – 21) (Header)…… Absolute value : "LNW" Relative value : "LN△"

Note: The talker output data format of this table has an underlined option ($\underline{***.**}$).
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

Table 9-4 Output Data Formats (2/11)

Data output item	Output request command	Talker output data format
Data in trace A (wavelength axis) Data in trace B (wavelength axis) Data in trace C (wavelength axis) Data in memory (wavelength axis)	WDATA R****-R**** WDATB R****-R**** WDATC R****-R**** WMEM$$ R****-R**** **** : 1 to 1001 $$: 0 to 31 (memory address)	* (SD) ... String delimiter (BD) ... Block delimiter Space ↓ NM△△****(SD)****.***(SD)...****.***(BD) ↓ Number of data (1 to 1001) ↓ Wavelength axis data (nm) ↓ Data continues according to the number of data.
Trace list/memory list data	ST**? ** : A (Trace A) B (Trace B) C (Trace C) 0 to 31 (memory address)	ST**△XXXX.XX(SD)XXXX.X(SD)XXX.X(SD)X.XXX(SD)XX.X(SD) ↓ Center wavelength ↓ Span ↓ REF level ↓ Level scale ↓ Resolution XXXX(SD)XXXX(SD)XXXXXX(SD)XXX(SD)XXXXXXX(BD) ↓ AVERAGE ↓ Sampling point ↓ SENSE ↓ Monochro ↓ ATTR
	<Range of each parameter> Center wavelength: 350.00 to 1750.00 (nm) Span: 0.0 to 1500.0 (nm) REF level: –90.0 to 20.0 (dBm) Level scale: 0.1 to 10.0 (dB/DIV). For LIN, sub scale LIN: 0.005 to 1.250 Resolution: 0.05 to 10.0 (nm) Number of averaging times: 1 to 1000	Sampling count: 11 to 1001 Measuring sensitivity: NR HLD, NR AT, HIGH 1, HIGH 2, HIGH 3, PLSLPF, PLSPKH, PLSEXT Monochro setting: SGL, DBL Type of waveform: MEAS, MAXH, MINH, RAVG***(2 to 100), A–B, B–A, A–BL, B–AL, A+BL, NORM, DOMI, CVFT, CVPK

Table 9-4 Output Data Formats (3/11)

Data output item	Output request command	Talker output data format	
Moving △ marker value Fixed marker 1 value Fixed marker 2 value	MKR? MKR1? MKR2?	Wavelength display for LOG scale WMKR△ △****.***(SD)±***.**(BD) WMKR1△△****.***(SD)±***.**(BD) WMKR2△△****.***(SD)±***.**(BD) Wave-length (nm) Level (dBm or dB) Frequency display for LOG scale FMKR△ △***.****(SD)±***.**(BD) FMKR1△ △***.****(SD)±***.**(BD) FMKR2△ △***.****(SD)±***.**(BD) Frequency (THz) Level (dBm or dB)	Wavelength display for LIN scale WMKR△ △****.***(SD)*.***E±**(BD) WMKR1△△****.***(SD)*.***E±**(BD) WMKR2△△****.***(SD)*.***E±**(BD) Wave-length (nm) Level (dBm or dB) Frequency display for LIN scale FMKR△ △***.****(SD)*.***E±**(BD) FMKR1△ △***.****(SD)*.***E±**(BD) FMKR2△ △***.****(SD)*.***E±**(BD) Frequency (THz) Level (W or no unit)
Line marker 1 value (wavelength) Line marker 2 value (wavelength)	L1MK? L2MK?	When displayed in wevelength LMKR1△ △****.***(BD) LMKR2△ △****.***(BD) Wavelength (nm)	When displayed in wevelength LFMK1△ △***.****(BD) LFMK2△ △***.****(BD) Frequency (THz)
Line marker 3 value (level) Line marker 4 value (level)	L3MK? L4MK?	For LOG scale LMKR3△ ±***.**(BD) LMKR4△ ±***.**(BD) Level (dBm or dB)	For LIN scale LFMK3△ △*.***E±**(BD) LFMK4△ △*.***E±**(BD) Level (W or no unit)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

Table 9-4 Output Data Formats (4/11)

Data output item	Output request command	Talker output data format
Analysis result	ANA?	(SPECTRAL WIDTH) When marker is expressed in wevelength : (Header) △****.***(SD)****.***(SD)***(BD) Mean wavelength (nm) Spectral width (nm) Number of modes When marker is expressed in frequency : (Header) △***.****(SD)***.****(SD)***(BD) Mean wavelength (THz) Spectral width (THz) Number of modes (Header)... ENV → "SEEN" THRESH → "SWTH" RMS → "SWRM" PK RMS → "SWPR"

Table 9-4 Output Data Formats (5/11)

Data output item	Output request command	Talker output data format
Analysis result	ANA?	(SMSR) When marker is expressed in wevelength : SMSR△****.***(SD)±***.**(SD)****.***(SD)±***.**(SD) Peak wavelength (nm) / Peak level (dBm) / 2nd peak wavelength (nm) / 2nd peak level (dBm) ****.***(SD)±***.**(BD) Wavelength difference (nm) / Level difference (SMSR) (dB) When marker is expressed in frequency : SMSR△***.****(SD)±***.**(SD)***.****(SD)±***.**(SD) Peak wavelength (THz) / Peak level (dBm) / 2nd peak wavelength (THz) / 2nd peak level (dBm) ***.****(SD)±***.**(BD) Wavelength difference (THz) / Level difference (SMSR) (dB)
		(POWER LOG scale) PDBM△±***.**(BD) Power (dBm) (POWER LIN scale) PLNW△*.***E±**(BD) Power (W)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

Table 9-4 Output Data Formats (6/11)

Data output item	Output request command	Talker output data format
Analysis result	ANA?	(COLOR ANALYSIS) When maker is expressed in wevelength : COL△△****.***(SD)*.***E-**(SD)*.***E-**(SD)*.***E-**(BD) Dominant wavelength (nm) X coordinate Y coordinate Z coordinate When marker is expressed in frequency : COL△△***.****(SD)*.***E-**(SD)*.***E-**(SD)*.***E-**(BD) Dominant wavelength (THz) X coordinate Y coordinate Z coordinate
		(EDFA NF) EDNF△***.**(SD)****.*** (SD)±***.**(SD)***.**(BD) Gain (dB) Measuring resolution (nm) ASE power (dBm) NF (dB)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output

Table 9-4 Output Data Formats (7/11)

Data output item	Output request command	Talker output data format
Analysis results	ANA?	(WDM) When marker is set to display the wavelength : WDM***(SD)***.***(SD)***.**(SD)***.**(SD).....(BD) Mode count / Peak wavelength (nm) / Peak level (dBm) / SNR (dB) / Iteration of Items 2 to 4 When marker is set to display the frequency : WDM***(SD)***.***(SD)***.**(SD)***.**(SD).....(BD) Mode count / Peak frequency (THz) / Peak level (dBm) / SNR (dB) / Iteration of Items 2 to 4
		(NOTCH) When marker is set to display the wavelength : SWNC****.***(SD)****.***(BD) Center wavelength (nm) / Notch width (nm) When marker is set to display the frequency : SWNC****.***(SD)****.***(BD) Center wavelength (THz) / Notch width (THz)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

Table 9-4 Output Data Formats (8/11)

Data output item	Output request command	Talker output data format
Analysis result	ANA?	(FP-LD ANAYLYSIS) When marker is expressed in wevelength : FPLD△****.***(SD)****.***(SD)±***.**(SD)****.***(SD) ±***.**(SD)****(BD) Spectral width (nm) Peak wavelength (nm) Peak level (dBm) Mean wavelength (nm) Total power (dBm) Number of modes When marker is expressed in frequency FPLD△***.****(SD)***.****(SD)±***.**(SD)***.****(SD) ±***.**(SD)****(BD) Spectral width (THz) Peak wavelength (THz) Peak level (dBm) Mean wavelength (THz) Total power (dBm) Number of modes
		(DFB-LD ANALYSIS) When marker is expressed in wevelength : DFB△△****.***(SD)****.***(SD)±***.**(SD)****.***(SD) ±***.** (BD) Spectral width (nm) Peak wavelength (nm) Peak level (dBm) Mode offset (nm) SMSR (dB) When marker is expressed in frequency : DFB△△***.****(SD)***.****(SD)±***.**(SD)***.****(SD) ±***.** (BD) Spectral width (THz) Peak wavelength (THz) Peak level (dBm) Mode offset (THz) SMSR (dB)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output

Table 9-4 Output Data Formats (9/11)

Data output item	Output request command	Talker output data format
Analysis result	ANA?	(LED ANALYSIS) When marker is expressed in wevelength : LED△△****.***(SD)****.***(SD)±***.**(SD)****.***(SD) ±***.** (BD) Spectral width (nm) Peak wavelength (nm) Peak level (dBm) Mean wavelength (nm) Total power (dBm) When marker is expressed in frequency : LED△△***.****(SD)* **.****(SD)±***.**(SD)** *.****(SD) ±***.** (BD) Spectral width (THz) Peak wavelength (THz) Peak level (dBm) Mean wavelength (THz) Total power (dBm)
Analysis parameters	FPLD*?	(FP-LD) FPLD##*(SD)*(SD)****(SD)****(SD)****(SD)*(SD)****(SD)****(BD) 1st option: Parameter to be set 0:SPEC WIDTH 1:MEAN WL 2:TOTAL POWER 3:MODE NO. 2nd option: Algorithm 0:ENV 1:THRESH 2:RMS 3:PEAK RMS 4:POWER 3rd option: TH (dB) 4th option: TH2 (dB) 5th option: K 6th option: MODE FIT, 0=OFF, 1=ON 7th option: MODE DIFF (dB) 8th option: OFFSET LEVEL (dB)

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

Table 9-4 Output Data Formats (10/11)

Data output item	Output request command	Talker output data format
Analysis result	DFBLE*?	(DFB-LD) DFBLD#*(SD)*(SD)****(SD)****(SD)****(SD)*(SD)****(SD)****(BD) 1st option: Parameter to be set 0:−XdB WIDTH 1:SMSR 2nd option: Algorithm 0:ENV 1:THRESH 2:RMS 3:PEAK RMS 4:SMSR1 5: SMSR2 3rd option: TH (dB) 4th option: TH2 (dB) 5th option: K 6th option: MODE FIT, 0=OFF, 1=ON 7th option: MODE DIFF (dB) 8th option: SMSR MASK (nm)
	LED*?	(LED) LED###*(SD)*(SD)****(SD)****(SD)****(SD)*(SD)****(SD)****(BD) 1st option: Parameter to be set 0:SPEC WIDTH 1:MEAN WL 2:TOTAL POWER 2nd option: Algorithm 0:ENV 1:THRESH 2:RMS 3:PEAK RMS 4:POWER 3rd option: TH (dB) 4th option: TH2 (dB) 5th option: K 6th option: MODE FIT, 0=OFF, 1=ON 7th option: MODE DIFF (dB) 8th option: SMSR MASK (nm)

Table 9-4 Output Data Formats (11/11)

Data output item	Output request command	Talker output data format	
Power meter function measurement data	PMTR? MAXP? MINP?	Absolute value LOG scale PMDBM△±***.**(BD) Power (dBm)	Absolute value LIN scale PMLNW△*.***E±**(BD) Power (W)
		Relative value LOG scale PMDB△△±***.**(BD) Power (dBm)	Relative value LIN scale PMLN△△*.***E±**(BD) Power (Unit not specified)
		• In OVER, numeral section is replaced by "OVR". • In UNDER, numeral section is replaced by "UND"	
FD directory	DIR?	DIR△***(SD)***********(SD)**** (SD) Number of files Volume name Residual capacity (K Byte)	********.***△**-**-**△**:**(SD) ********.***△**-**-**△**:**(SD) ⋮ ********.***△**-**-**△**:**(SD) File name Year-month-day Hour:minute
File name lastly read or written in FD	FNAME?	FN△********.***(BD) File name	
Warning error number	WARN?	WARN△***(BD) Number	

*Note: The talker output data format of this table has an underlined option (***.**).*
If three decimal digits (LDTDIG 3) are specified for this option, the data of up to three decimal digits is output.

9.2.7 Service request function

When measurement is completed, print or plot processing is completed or printer paper is used up, this function sends out an SRQ signal. After that, when serial polling is performed from the controller, the function sends out a status byte. Table 9-5 shows the contents of the status byte.

SRQ transmission can be enabled or disabled by a program code.

When the power supply is turned on, the SRQ send disable status is set. Table 9-6 shows the program codes related to SRQ transmission.

The contents of the status byte are cleared when serial polling is performed or a DCL or SDC message is received in the SQR send enable status.

Table 9-5 Program Codes Related to SRQ Transmission

Program code	Contents
SRQ1	The transmission of SRQ signal is enabled.
SRQ0	The transmission of SRQ signal is disabled

1. SRQ function of GP-IB 1 port

When the device message "SRQ1" is received and the SRQ send mode is set, the status byte shown below plus the RQS bit are set for each cause, thereby making a service request.

① Function and setting condition of each bit

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	RQS	BUFOVR	0	CMDERR	WARN	DONE	DT RDY

Table 9-6 Contents of Status Byte

Bit	Function and setting condition	Clear timing
bit 7	0	
bit 6	Sends an SRQ signal.	• Upon execution of serial pulling • Upon receipt of DCL or SDC
bit 5	When receiving data exceeding the receive buffer capacity of 512 bytes, "1" is set.	• Upon execution of serial polling • Upon receipt of DCL or SDC • At a start of measurement
bit 4	0	
bit 3	When a command data error occurs, "1" is set.	• Upon execution of serial polling • Upon receipt of DCL or SDC • At a start of measurement
bit 2	When a warning error (including program execute error) occurs, "1" is set. For the contents of the warning, its number can be output by the talker command "WARN?".	• When the warning error display disappears • Upon execution of serial polling • Upon receipt of DCL or SDC • At a start of measurement
bit 1	When the execution of the FD copy program terminates or when a setup operation for optical output is completed, "1" is set.	• Upon execution of serial polling • Upon receipt of DCL or SDC • At a start of measurement
bit 0	When a sweep is completed, "1" is set.	• Upon execution of serial polling • Upon receipt of DCL or SDC • At a start of measurement

② Mask function for each bit

If the bit to be masked is set to "1" by the GP-IB command "SRMSK*** (0 to 255)", each bit cannot be set even upon occurrence of each cause.

For example, when bit 0 and bit 2 are masked by the "SRMSK5" command and the corresponding cause occurs, this bit is not set. When the cause is related to only the contents of the masked bit, the RQS bit (bit 6) is not set, too.

When mask data includes bit 6, the RQS bit is not set even in the SRQ send enable status.

2 SRQ function of GP-IB 2 port

The SRQ send function of the GP-IB 2 port is not available.

However, serial polling can be executed by the program function.

3. Device clear function

Upon receipt of DCL or SDC, initialization is executed in the same way as POWER ON resetting.

4 Device trigger function

Upon receipt of GET, single sweep processing is performed.

9.2.8 Precautions on programming

(1) The program codes corresponding to the functions that are disabled in the manual operation mode are ignored. In this case, a WARNING message is displayed on the screen in the same way as in the manual operation mode.

(2) When the seep, print and plot program codes and other program codes are sent continuously, the latter program codes will be executed at once before completion of sweep, print and plot processing. In particular, in the print or plot status, most commands are invalid. To know whether the sweep, print or plot processing is completed or not, use the service request function.

(3) When this equipment is specified as a talker in the sweep status, waveform data is output after completion of sweep processing.

(4) Before using the service request function, permit SRQ transmission at the beginning of a program and perform serial polling, and then read the status byte unreally.
The contents of the status byte are held until serial polling is started. In this period, the SRQ signal is not cleared. Accordingly, when an SRQ signal is generated before program execution, first read the status byte unreally. Otherwise, an SRQ signal becomes hard to generate after that.

(5) String delimiter specification, block delimiter specification, data output request setting and SRQ end enable status setting are reset to the initial status when the power supply is turned off.

9.2.9 Program code compatibility with AQ-6312A/B

The AQ-6312A/B program codes can be used in this equipment except for some of them. However, some program codes are usable but functionally different. For this reason, use them taking the following points into consideration.

(1) "RPT:RAPID" and "SGL:RAPID" perform a sweep with 501 sampling points.

(2) "SWP:INTVL ***" sets the number of sampling points to (span/***) + 1.

(3) "SWP:INTVL NORM" sets the number of sampling points to 1001.

(4) "WMKR****" handles the parameter as a wavelength value.

(5) "SAVE**" writes the data of trace A into memory.

(6) "RCL**" and "CALC:ACCA=**" read data to the trace A.

(7) "CALC:ACCB=**" reads data to the trace B.

(8) "CALC:LMAX****" handles the parameter as a value per DIV on the subscale (LIN scale).

(9) "DDATA R***-R***" outputs the data of trace A. However, the parameter range is 1 - 1001.

(10) The following program codes are ignored.

"3D:CUR CLR", "SMSR3", "SMSR4", "PRESET:DIV*", "SPECWD:THRESHB**", "LMKR ***" "MEM:RTN", "EXEC 'program name'", "DEF**:'program name'", "DEF : OFF", "LBL : OFF", "SET PTR : DT ***", "OTHERS:OFF", "FD : OFF" "STATE", "SOFTKEY:***".

(11) The output format for measured data is different.

9.2.10 Programming examples

The following gives the typical GP-IB programming examples where the NEC's PC-9801 and IBM PS/2 PC's (having the National Instruments' GP-IB interface board) are used.
These programs set the measuring conditions on the AQ-6315A/B, sweeps for a single time, and displays the measured data (both the waveforms and the measuring conditions) on the controller CRT screen.

(1) If the NEC's PC-9801 series PC is used as the controller

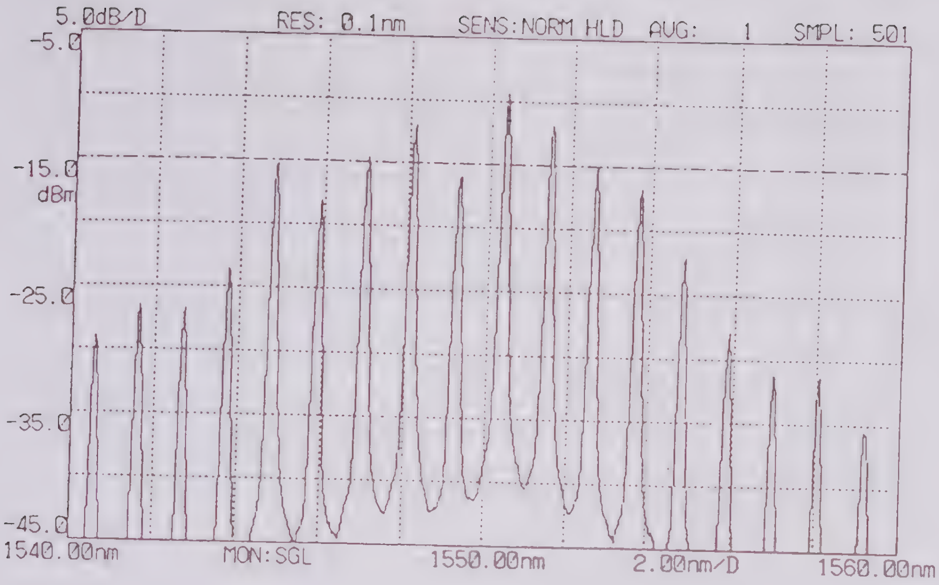
```
1000 ' AQ-6315A/B OPTICAL SPECTRUM ANALYZER
1010 '        GP-IB EXAMPLE PROGRAM
1020           FOR PC-9801 SERIES
1030 '
1040 DIM A(1001)
1050 SCREEN 3: CLS 3: CONSOLE 0,25,0,1
1060 ISET IFC
1070 ISET REN
1080 CMD DELIM=0
1090 ADRS=1
1100
1110 PRINT@ ADRS;"CTRWL1550.00,SPAN20.0,REFL-15.0, LSCL5.0, RESLNO.1, AVG1, SNHD"
1120 PRINT@ ADRS;"WRTA,DSPA,FIXB,BLKB,FIXC,BLKC"
1130 '
1140 PRINT@ ADRS;"SRQ1" : POLL ADRS,S
1150 PRINT@ ADRS;"SGL"
1160 POLL ADRS,S
1170 IF S<>65 THEN 1160
1180 '
1190 PRINT@ ADRS;"SD1,LDATA"
1200 INPUT@ ADRS;DUMMY$
1210 FOR I=1 TO 1001
1220  INPUT@ ADRS;DT$
1230  A(I)=VAL(DT$)
1240 NEXT I
1250 '
1260 PRINT@ ADRS;"CTRWL?"
1270 INPUT@ ADRS;CTR$
1280 CTR=VAL(CTR$)
1290 PRINT@ ADRS;"SPAN?"
1300 INPUT@ ADRS;SPAN$
1310 SPAN=VAL(SPAN$)
1320 PRINT@ ADRS;"REFL?"
1330 INPUT@ ADRS;REF$
1340 REF=VAL(REF$)
1350 PRINT@ ADRS;"LSCL?"
1360 INPUT@ ADRS;LSCL$
1370 LSCL=VAL(LSCL$)
1380 PRINT@ ADRS;"RESLN?"
1390 INPUT@ ADRS;RES$
1400 RES=VAL(RES$)
1410 PRINT@ ADRS;"AVG?"
```

```
1420 INPUT@ ADRS;AVG$
1430 AVG=VAL(AVG$)
1440 PRINT@ ADRS;"SMPL?"
1450 INPUT@ ADRS;SMPL$
1460 SMPL=VAL(SMPL$)
1470 PRINT@ ADRS;"SENS?"
1480 INPUT@ ADRS;SENS$
1490 IF SENS$="1" THEN SENS$="HIGH 1"
1500 IF SENS$="2" THEN SENS$="HIGH 2"
1510 IF SENS$="3" THEN SENS$="HIGH 3"
1520 IF SENS$="4" THEN SENS$="NORM HLD"
1530 IF SENS$="5" THEN SENS$="NORM AUT"
1540 PRINT@ ADRS;"MONO?"
1550 INPUT@ ADRS;MONO$
1560 IF MONO$="0" THEN MONO$="SGL"
1570 IF MONO$="1" THEN MONO$="DBL"
1580 START=CTR-SPAN/2
1590 STP=CTR+SPAN/2
1600 REF1=REF+LSCL*2 : YMAX=REF1
1610 REF2=REF-LSCL*2
1620 REF3=REF-LSCL*4
1630 REF4=REF-LSCL*6 : YMIN=REF4
1640 '
1650 VIEW(48,16)-(560,336)
1660 WINDOW(1, -YMAX)-(1001, -YMIN)
1670 LINE(1, -YMAX)-(1001, -YMIN),5,B
1680 LINE(1001,-(REF+LSCL))-(1,-(REF+LSCL)),5,,&H9999
1690 LINE(1001,-REF)-(1,-REF),5,,&HF99F
1770 FOR I=1 TO 5
1710  LINE(1001,-(REF-LSCL*I))-(1,-(REF-LSCL*I)),5,,&H9999
1720 NEXT I
1730 FOR I=1 TO 9
1740  LINE(1+I*100,-YMAX)-(1+I*100,-YMIN),5,,&H9999
1750 NEXT I
1760 '
1770 LINE(1,-A(1))-(1,-A(1)),6
1780 FOR I=1 TO 1001
1790  LINE -(I,-A(I)),6
1800 NEXT I
1810 '
1820 COLOR 7
1830 LOCATE 3,0
1840 PRINT USING "##.#dB/D";LSCL
1850 LOCATE 21,0
1860 PRINT USING "RES:##.#nm  SENS:$    & AVG:####   SMPL:####"; RES, SENS$,
AVG,SMPL
1870 LOCATE 1,1
1880 PRINT USING "###.#";REF1
1890 LOCATE 1,6
1900 PRINT USING "###.#";REF
1910 LOCATE 3,7
1920 PRINT "dBm"
1930 LOCATE 1,11
```

```
1940 PRINT USING "###.#";REF2
1950 LOCATE 1,16
1960 PRINT USING "###.#";REF3
1970 LOCATE 1,20
1980 PRINT USING "###.#";REF4
1990 LOCATE 1,21
2000 PRINT USING "####.##nm    MON:& &     ####.##nm    ###.##nm/D    ####.##nm
";START,MONO$,CTR,SPAN/10,STP
2010 END
```

Explanation of each program line

Line 1040	Declares an array of the measuring waveforms data.
Line 1050	Initializes the screen.
Line 1060	Initializes the GP-IB interface by issuing IFC.
Line 1070	Sets the REN to True.
Line 1080	Sets the CRLF block delimiter for program code output.
Line 1090	Assigns the AQ-6315A/B address to variable ADRS. (This example sets value 1.)
Line 1110	Sends a program code to the AQ-6315A/B and sets the measuring conditions. This example sets the following: Center wavelength : 1550.00 nm, Sweep width : 20.0 nm, Reference level : —15.0 dBm Level scale : 5.0 dB/div., Resolution : 0.1 nm, Averaging count : 1 time Measuring sensitivity : Normal Range Hold
Line 1120	Sends a program code to the AQ-6315A/B and sets the following tracing conditions. Trace A : Write mode with display Trace B: Fixed mode with no display Trace C: Fixed mode with no display
Line 1140	Reads the status byte before measurement.
Line 1150	Sends a program code to the AQ-6315A/B and sweeps for a single time.
Lines 1160 and 1170	Read the status byte and wait for a sweep end.
Line 1190	Sets the CRLF string delimiter for data output, and requests for an output of trace-A waveforms data.
Lines 1200 to 1240	Read the waveforms data and assigns them in array A (I).
Lines 1260 to 1570	Read the measuring conditions and assign them in each variable.
Lines 1580 and 1590	Determines the wavelength at the beginning and end of measurement.
Lines 1600 to 1630	Determine the level (except for the reference level) displayed on the level axis.
Line 1650	Specifies the graphics display range on the controller screen.
Line 1660	Determines the coordinates of the specified range.
Line 1670	Draws a ruled line around the graphics.
Lines 1680 to 1720	Draw a level scale of the graphics. The reference level is drawn by dotted and dashed lines, but the others are drawn by dotted lines.
Lines 1730 to 1750	Draw a wavelength scale of the graphics.
Lines 1770 to 1800	Draw the measured waveforms.
Lines 1820 to 2000	Display the measuring conditions around the graphics.



Program execution results (displayed on the controller screen)

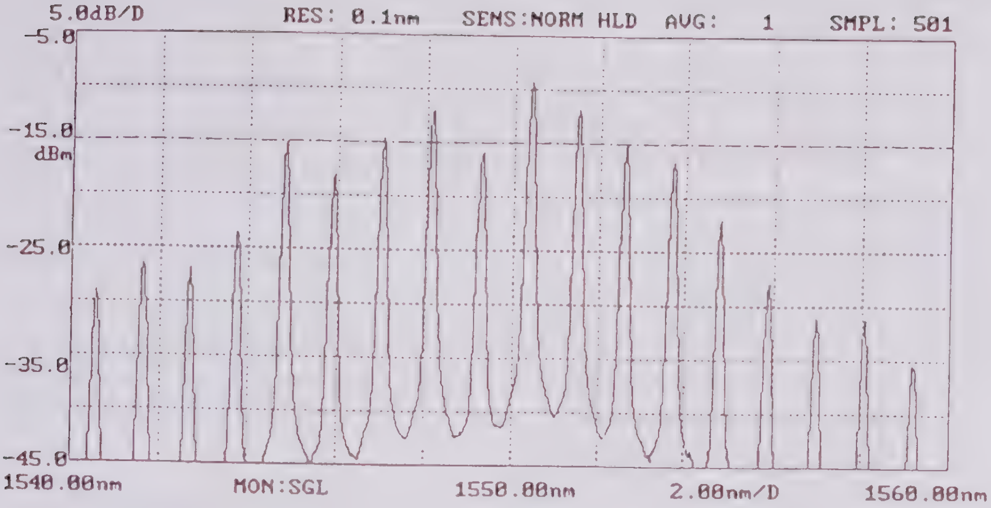
(2) If the IBM PC/2 series PC is used as the controller

```
1000 '       AQ-6315A/B Optical Spectrum Analyzer
1010 '              GP-IB Example Program
1020            For IBM PS/2 Series (BASICA)
1030 '       (Merge this program with "DECL.BAS")
1040 DIM A(1001)
1050 SCREEN 9: CLS
1060 '
1070 DEV$="DEV1" : CALL IBFIND(DEV$,ND%)
1080 '
1090 CMD$="CTRWL1550.00,SPAN20.0,REFL-15.0,LSCL5.0,RESLN0.1,AVG1,SNHD,SRQ1"
   +CHR$(13)+CHR$(10)
1100 CALL IBWRT(ND%,CMD$)
1110 CMD$="WRTA,DSPA,FIXB,BLKB,FIXC,BLKC"+CHR$(13)+CHR$(10)
1120 CALL IBWRT(ND%,CMD$)
1130
1140 CALL IBRSP(ND%,SP%)
1150 CMD$="SGL"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1160 MASK%=&H800 : CALL IBWAIT(ND%,MASK%)
1170 '
1180 V%=ASC(",")+&H400 : CALL IBEOS (ND%,V%)
1190 CMD$="LDATA"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1200 DUMMY$=SPACE$(7) : CALL IBRD(ND%,DUMMY$)
1210 FOR I=1 TO 1001
1220   DT$=SPACE$(9) : CALL IBRD(ND%,DT$)
1230   A(I)=VAL(DT$)
1240 NEXT I
1250 '
1260 V%=0 : CALL IBEOS(ND%,V%)
1270 CMD$="CTRWL?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1280 ST$=SPACE$(9) : CALL IBRD(ND%,ST$)
1290 CTR=VAL(ST$)
1300 CMD$="SPAN?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1310 ST$=SPACE$(8) : CALL IBRD(ND%,ST$)
1320 SPAN=VAL(ST$)
1330 CMD$="REFL?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1340 ST$=SPACE$(7) : CALL IBRD(ND%,ST$)
1350 REF=VAL(ST$)
1360 CMD$="LSCL?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD&)
1370 ST$=SPACE$(6) : CALL IBRD(ND%,ST$)
1380 LSCL=VAL(ST$)
1390 CMD$="RESLN?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1400 ST$=SPACE$(6) : CALL IBRD(ND%,ST$)
1410 RES=VAL(ST$)
1420 CMD$="AVG?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1430 ST$=SPACE$(6) : CALL IBRD(ND%,ST$)
1440 AVG=VAL(ST$)
1450 CMD$="SMPL?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1460 ST$=SPACE$(6) : CALL IBRD(ND%,ST$)
1470 SMPL=VAL(ST$)
1480 CMD$="SENS?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1490 ST$=SPACE$(3) : CALL IBRD(ND%,ST$)
1500 IF ST$="1"+CHR$(13)+CHR$(10) THEN SENS$="HIGH 1"
```

```
1510 IF ST$="2"+CHR$(13)+CHR$(10) THEN SENS$="HIGH 2"
1520 IF ST$="3"+CHR$(13)+CHR$(10) THEN SENS$="HIGH 3"
1530 IF ST$="4"+CHR$(13)+CHR$(10) THEN SENS$="NORM HLD"
1540 IF ST$="5"+CHR$(13)+CHR$(10) THEN SENS$="NORM AUT"
1550 CMD$="MONO?"+CHR$(13)+CHR$(10) : CALL IBWRT(ND%,CMD$)
1560 ST$=SPACE$(3)   CALL IBRD(ND%,ST$)
1570 IF ST$="0"+CHR$(13)+CHR$(10) THEN MONO$="SGL"
1580 IF ST$="1"+CHR$(13)+CHR$(10) THEN MONO$="DBL"
1590 START=CTR-SPAN/2
1600 STP=CTR+SPAN/2
1610 REF1=REF+LSCL*2 : YMAX=REF1
1620 REF2=REF-LSCL*2
1630 REF3=REF-LSCL*4
1640 REF4=REF-LSCL*6 : YMIN=REF4
1650 '
1660 VIEW (48,16)-(560,272)
1670 WINDOW (1,YMIN)-(1001,YMAX)
1680 LINE (1,YMIN)-(1001,YMAX),3,B
1690 LINE(1,(REF+LSCL))-(1001,(REF+LSCL)),3,,&H9999
1700 LINE(1,REF)-(1001,REF),3,,&HF99F
1710 FOR I=1 TO 5
1720  LINE (1,(REF-LSCL*I))-(1001,(REF-LSCL*I)),3,,&H9999
1730 NEXT I
1740 FOR I=1 TO 9
1750  LINE (1+I*100,YMIN)-(1+I*100,YMAX),3,,&H9999
1760 NEXT I
1770 '
1780 LINE(1,A(1))-(1,A(1)),14
1790 FOR I=1 TO 1001
1800  LINE -(I,A(I)),14
1810 NEXT I
1820 '
1830 COLOR 15
1840 LOCATE 1,4
1850 PRINT USING "##.#dB/D";LSCL
1860 LOCATE 1,22
1870 PRINT USING "RES:##.#nm  SENS:¥   ¥ AVG:####   SMPL:####";RES,SENS$,A
VG,SMPL
1880 LOCATE 2,2
1890 PRINT USING "###.#";REF1
1990 LOCATE 6,2
1910 PRINT USING "###.#";REF
1920 LOCATE 7,4
1930 PRINT "dBm"
1940 LOCATE 11,2
1950 PRINT USING "###.#";REF2
1960 LOCATE 16,2
1970 PRINT USING "###.#";REF3
1980 LOCATE 20,2
1990 PRINT USING "###.#";REF4
2000 LOCATE 21,2
2010 PRINT USING "####.##nm    MON:¥ ¥     ####.##nm     ###.##nm/D
 ####.##nm";START,MONO$,CTR,SPAN/10,STP
2020 END
```

Explanation of each program line

Line 1040	Declares an array of the measuring waveforms data.
Line 1050	Initializes the screen.
Line 1070	Opens the DEV1 file.
Lines 1090 to 1100	Sends a program code to the AQ-6315A/B and sets the measuring conditions. This example sets the following: Center wavelength : 1550.00 nm, Sweep width : 20.0 nm Reference level : −15.0 dBm, Level scale : 5.0 dB/div. Resolution : 0.1 nm, Averaging count : 1 time Measuring sensitivity : Normal Range Hold
Lines 1110 to 1120	Send program codes to the AQ-6315A/B and set the following tracing conditions. Trace A : Write mode with display Trace B : Fixed mode with no display Trace C : Fixed mode with no display
Line 1140	Reads the status byte before measurement.
Line 1150	Sends a program code to the AQ-6315A/B and sweeps for a single time.
Line 1160	Waits for a sweep end.
Lines 1180 and 1190	Set the CRLF string delimiter for data output, and request for an output of trace-A waveforms data.
Lines 1200 to 1240	Read the waveforms data and assigns them in array A (I).
Lines 1260 to 1580	Request for an output of measuring conditions, read the measuring conditions, and assign them in each variable.
Lines 1590 and 1600	Determine the wavelength at the beginning and end of measurement.
Lines 1610 to 1640	Determine the level (except for the reference level) displayed on the level axis.
Line 1660	Specifies the graphics display range on the controller screen.
Line 1670	Determines the coordinates of the specified range.
Line 1680	Draws a ruled line around the graphics.
Lines 1690 to 1730	Draws a level scale of the graphics. The reference level is drawn by dotted and dashed lines, but the others are drawn by dotted lines.
Lines 1740 to 1760	Draw a wavelength scale of the graphics.
Lines 1780 to 1810	Draw the measured waveforms.
Lines 1830 to 2010	Display the measuring conditions around the graphics.



```
5.0dB/D          RES: 0.1nm    SENS:NORM HLD   AVG:    1     SMPL: 501
MON:SGL
2.00nm/D
```

Program execution results (displayed on the controller screen)

9.3 Usage of GP-IB 2 Port

9.3.1 Interface functions of GP-IB 2 port

Table 9-7 shows the interface functions of the GP-IB 2 port

Table 9-7 Interface Functions of GP-IB 2 Port

Code	Interface function
SH1	All send functions
AH1	All receive functions
T4	Basic talker
L2	Basic listener
SR0	No service request function
RL0	No remote/local function
PP0	No parallel poll function
DC0	No device clear function
DT0	No device trigger function
C1	System controller
C2	IFC transmission
	Controller in-charge
C3	REN transmission
C11	Interface message transmission
	Control reception
	Control transfer
E1	Handshake synchronous control
	Open collector driver

9.3.2 Connection to GP-IB system

To the [GP-IB 2] port, connect the X-Y plotter and the GP-IB units to be controlled by program function.
Turn off the power supply of this equipment and the power supplies of the units to be connected to this equipment.
Connect the units to the GP-IB 2 connector on the rear side of this equipment by the GP-IB cord.
Tighten the fixing screw of the connector firmly.

CAUTION

If the GP-IB cord is connected or disconnected in the power ON status, this will cause a malfunction of failure to this equipment.

9.3.3 Address setting

The address of the [GP-IB 2] port is fixed at 30. For the X-Y plotter and other units that this equipment controls, the address can be selected in the range of 0 to 29

9.3.4 X-Y plotter control

The X-Y plotter connected to the GP-IB 2 port can be controlled by using this equipment as a controller. For X-Y plotter selection, enter "CPKY1" is entered as a command

For the details for X-Y plotter output setting and X-Y plotter address setting, refer to 5.1.18 [COPY] switch.

When "COPY 1" is entered as a command, data is output according to the preset conditions

9.3.5 External unit control

The external units connected to the GP-IB 2 port can be controlled by using the program function.

For details, refer to Chapter 6 Program Function.

Chapter 10 PRINCIPLE AND CIRCUIT CONFIGURATION

This chapter describes the principle of measurement and circuit configuration.

Contents of Chapter 10

10.1 Configuration and Principle of Monochromator 10-2
  10.1.1 Principle of monochromator 10-2
  10.1.2 Grating diffraction orders 10-3
  10.1.3 Signal detector 10-6
10.2 Circuit Configuration 10-7
10.3 Precautions on Measurement 10-8
  10.3.1 Types of optical fiber usable in this equipment 10-8
  10.3.2 Restriction on double monochromator 10-9
  10.3.3 Restriction on resolution 10-9
  10.3.4 Absolute level accuracy 10-9
  10.3.5 Effective range of level axis when the measuring sensitivity is set to NORMAL RANGE HOLD 10-10
  10.3.6 Stray light in the double monochromator mode 10-10
  10.3.7 Step at 600 or 650 nm 10-10
  10.3.8 Ripple around 1380 nm 10-10
  10.3.9 Wavelength sensitivity below 400 nm and above 1700 nm 10-11
  10.3.10 Level accuracy below fiber cable cutoff wavelength (short wave length) 10-11
  10.3.11 Optical axis adjustment during spectrum output (AQ-6315B) 10-11

10.1 Configuration and Principle of Monochromator

10.1.1 Principle of monochromator

This equipment is provided with a Zollner-Thurnar's type monochromator.
Figure 10-1 shows the basic configuration.

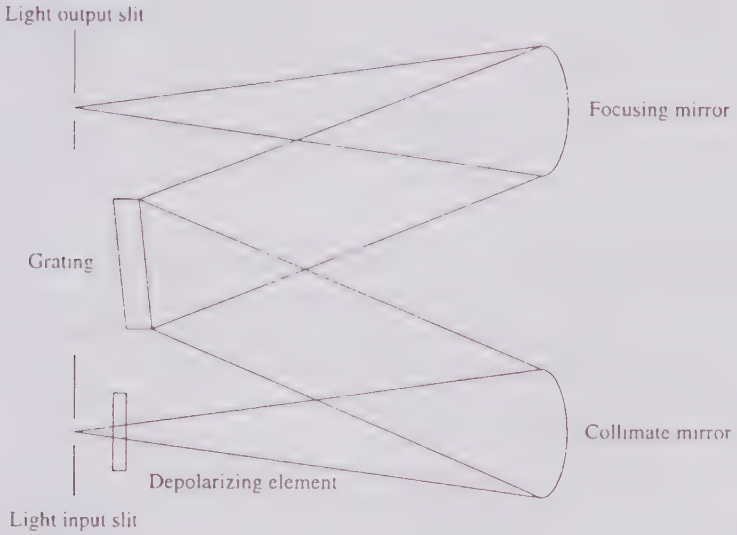


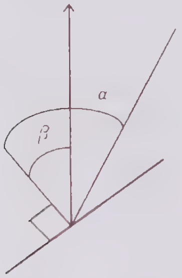
Fig. 10-1 Basic Configuration of Monochromator

The light input from the light input slit is changed into parallel light by the collimate mirror and enters the grating.
The grating provided with innumerable grooves on the surface of a flat mirror reflects light at a different angle depending on the wavelength.
Therefore, the focusing mirror is arranged so as to receive only the light reflected in a specific direction and the light output slit is arranged at the position where the reflected light of the focusing mirror is focalized. This permits taking out only specific wavelength component by the slit.
The wavelength that can be transmitted through the slit can be changed by turning the grating, while the wavelength resolution can be changed by changing the widths of the light input slit and light output slit.
This equipment is designed in such a way that the optical fiber core may function as a slit without using a light input slit. For the collimate mirror and focusing mirror, axis parabolic mirrors free from axis are used to suppress aberration. Furthermore, the depolarizing element is provided in the input section to convert input light into a polarization-free status, thereby lowering the dependency on polarization
When the double monochromator is used, light is passed twice through the monochromator, so that the stray light level is greatly improved as compared with the single monochromator.

10.1.2 Grating diffraction orders

The grating reflects light at a different angle depending on the wavelength.
The relationship between wavelength and angle is represented by the following expression.

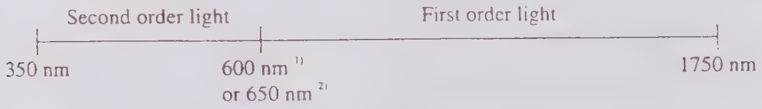
$$\lambda=\frac{d}{m}(\sin\alpha+\sin\beta),\ m=0,\ 1,\ 2,\ \cdots$$



where,
α : Angle of incidence
β : Angle of reflection
d : Groove-to-groove space
m : Diffraction order

Thus, a wavelength λ is not reflected in a single direction but in multiple directions corresponding to m = 0, 1, 2, ... The direction of the strongest reflection depends on the wavelength.

For this reason, when the diffraction order is changed according to the wavelength to be measured, measurement can be made in a wider band. In this equipment, measurement is made by switching between second order diffracted light and first order diffracted light.
Figure 10-2 shows the usable division of each of them.



1) When the mean wavelength is set to 635 nm or more

2) When the mean wavelength is set to less than 635 nm.

Fig. 10-2 Usable Divisions of Diffracted Orders

At the order switching point, the effective resolution changes a little. Accordingly, if a light source having an optical spectrum of a wider wavelength range than the set resolution is measured, the measurement level may become discontinuous at the order switching point (600 nm) and a step may form.

To keep this level difference as far away as possible from the center of the screen, the switching point is changed by setting the mean wavelength as shown in the previous figure.

As described before, the grating reflects a wavelength in multiple directions, so that optical spectrums will appear besides the real waveform.

In this equipment, an optical filter cuts high order light and low order light other than the order to be measured. With this, false optical spectrums are suppressed at a lower level than the correct optical spectrum.

The optical filter is switched over to 4 types of filter for different wavelength bands.
During a sweep, filter switching is performed at up to 3 positions.
Table 10-1 shows the wavelength for which filter switching is performed.

Table 10-1 Switching Wavelength of Filter

Filter switching point	Switching wavelength
1	500 nm (when the mean wavelength is set to less than 485 nm) or 470 nm (when the mean wavelength is set to 485 nm or more)
2	The same as the switching wavelength of diffraction order (→ Fig. 10-2)
3	The same as the switching wavelength of sensor (→ Table 10-2)

However, it is impossible to completely eliminate unnecessary high order light and low order light through the optical filter. They can be suppressed more than the correct optical spectrum but some false optical spectrums appear. For use, it is important to know where false optical spectrums appear.

Figure 10-3 shows a graph representing the relationship between the wavelength displayed on the screen and the real wavelength. The axis of abscissas becomes the wavelength displayed on the screen and the axis of ordinates becomes the real wavelength. The solid line on the graph represents the relationship between the displayed wavelength and the real wavelength. The thick solid line indicates the relationship of optical spectrums (naturally, there is a match between displayed wavelength and real wavelength), while the thin solid line indicates the relationship of false optical spectrums of high order light and low order light.

The number put by the side of the thin solid line indicates how much the false optical spectrum is suppressed to the correct optical spectrum. (During single monochrome mode only; unit in dB)

However, the value is as approximate value only for reference byt is not a quaranteed value.

For example, when 633 nm light is entered, draw a line horizontally from the position of 633 nm on the axis of abscissas. The point where this line intersects the line on the graph becomes a displayed wavelength. From Figure 10-3, it is known that a false optical spectrum appears at the position of 1266 nm besides 633 nm, and that this false optical spectrum is suppressed at a lower level by 60 dB more to the correct optical spectrum.

(If center wavelength ≥ 1025 nm)

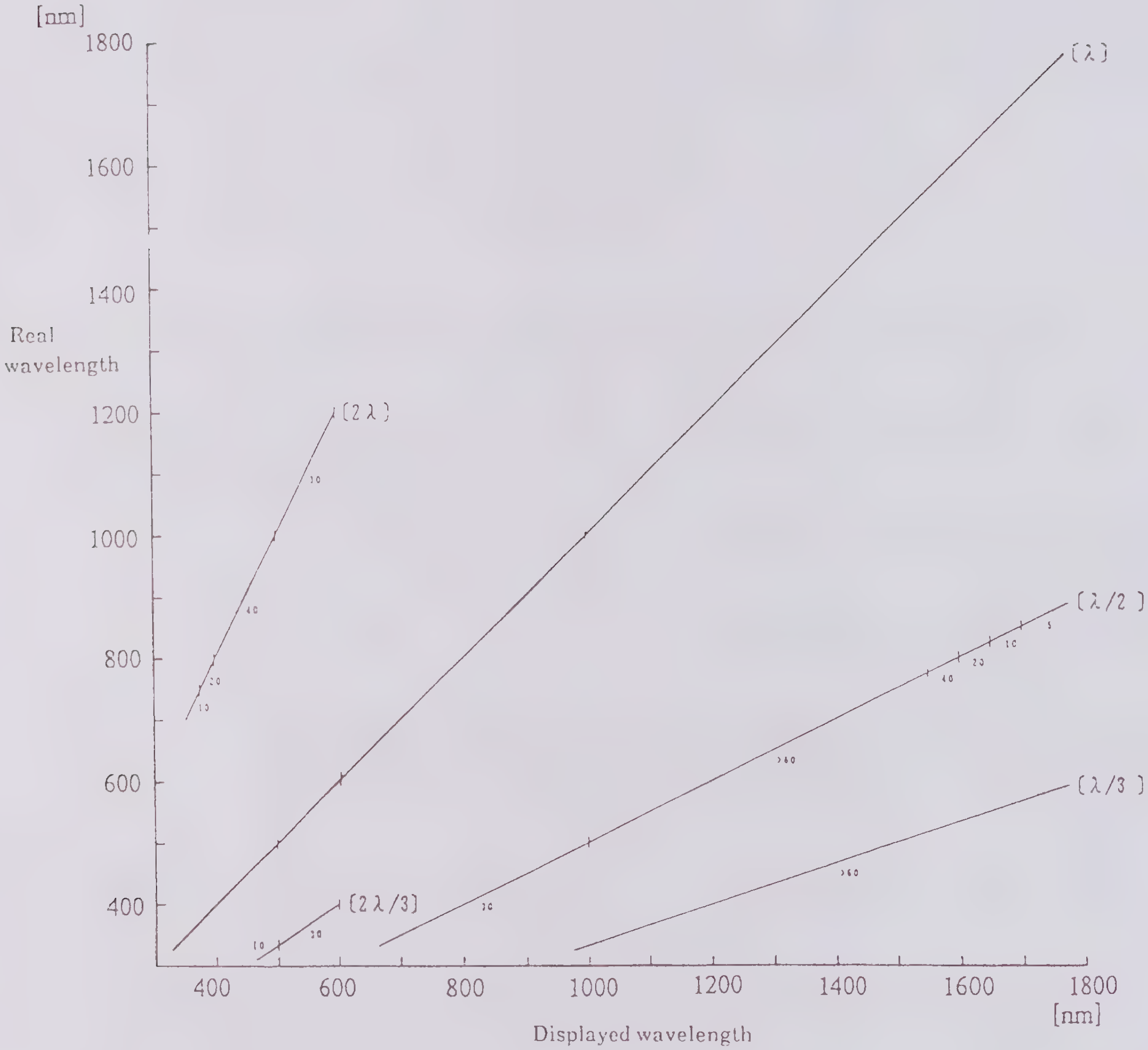


Fig. 10-3 Relationship between Displayed Wavelength and Real Wavelength

10.1.3 Signal detector

The light coming out from the monochromator is led to the signal detector. The signal detector consists of two optical sensors for short wavelength and long wavelength and a switch to select one of these optical sensors. With this signal detector, the light is converted into an electric signal according to its intensity. Table 10-2 shows the wavelengths for which the optical sensors are switched.

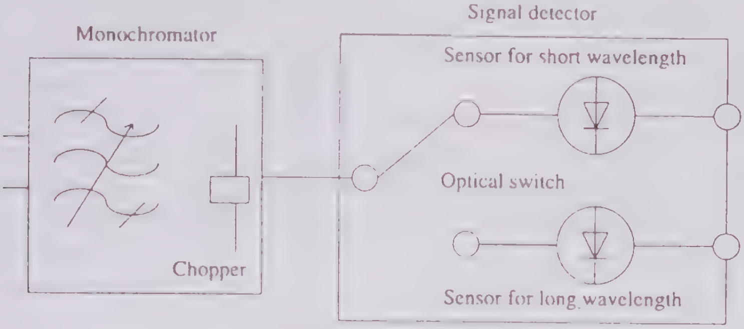


Fig. 10-4 Signal Detector Configuration

Table 10-2 Sensor Switching Points

Mean wavelength setting	Sensor switching wavelength
Less than 1025 nm	1050 nm
1025 nm or more	1000 nm

When the measuring sensitivity is set to HIGH1 to 3, light chopping is performed by the optical chopper built in the monochromator. With this, the electric output of the optical sensor becomes an AC signal and the effects of offset and drift of the optical sensor and AMP circuit are reduced.

Only the chopping frequency component is taken out by the synchronous detector circuit and passed through a low-pass filter, thereby attaining high sensitivity. The chopping frequency is set to 270 Hz.

When the measuring sensitivity is set to NORM, the optical chopper does not function but detection is not required, so that the AMP can respond quickly, thereby increasing the measuring speed.

The AMP offset status is automatically canceled at certain intervals of time. At this time, the sweep stops for about 4 seconds. The offset cancel operation can be cleared by the user and also can be performed by key operation when it is necessary. (→ 5.1.14 (10) <AUTO OFFSET> key)

10.2 Circuit Configuration

Figure 10-5 shows the circuit configuration of this equipment.

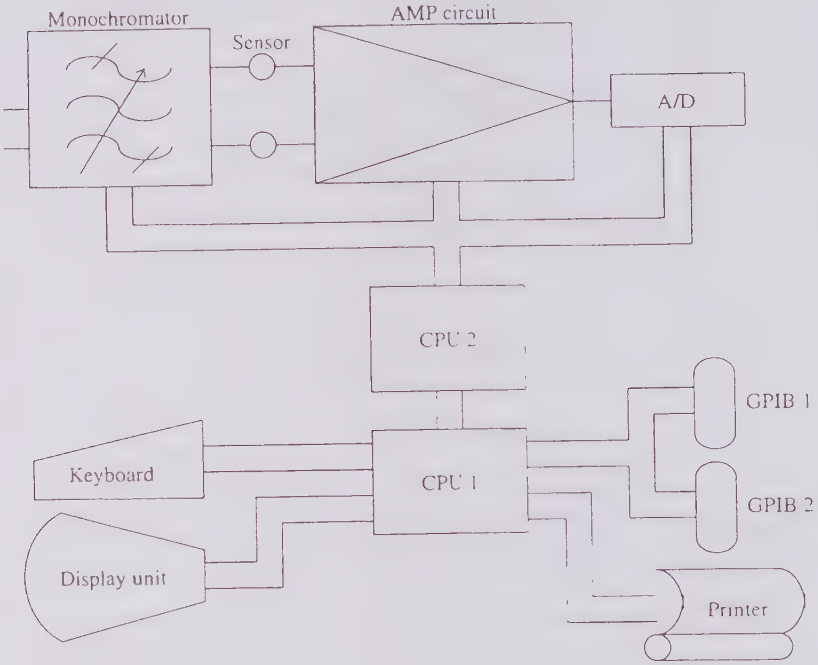


Fig. 10-5 Circuit Configuration of this Equipment

The grating of the monochromator controls the angle by means of a stepping motor.
The stepping motor is used to set a width to the slit, too. The stepping motor is also used to control the chopper and optical switch.

Out of the light entering from the [OPTICAL INPUT] connector, only the wavelength component to be measured by the monochromator is taken out and converted into an electric signal by the light receiver.
Then, the signal is amplified to a level fit for A/D conversion by the AMP circuit.
The amplified signal is converted into a digital signal by the A/D conversion circuit.

As a gain of the AMP circuit, an optimum value is selected by setting the reference level.
When the measuring sensitivity is set to HIGH1 to 3, auto gain adjustment is made by following up the input level, thereby enlarging the dynamic range.

The control circuit consists of a 32-bit CPU and a 16-bit CPU. The CPU1 controls the whole, key input, GP-IB ports, display unit and printer, while the CPU2 controls the monochromator, light receiver, AMP circuit and A/D conversion circuit.

10.3 Precautions on Measurement

This equipment is designed for different purposes but has some restrictions. Be careful about the following items at measurement.

10.3.1 Types of optical fiber usable in this equipment

In this equipment, any of single mode optical fibers with a core diameter of 5 to 10 µm to large-caliber fiber with a core diameter of 800 µm are usable for optical input. However, some restrictions are provided for some types of optical fiber. The following table shows the adaptability of typical optical fibers and restrictions.

This equipment is designed exclusively for optical fiber input. Such means as inputting gas laser beams directly to the optical input connector and causing the LED to adhere to the optical connector unit cannot be used instead of inputting light using an optical fiber. Note that the optical spectrum measured by these means is not trustworthy at all.

For space light measurement, input space light to an optical fiber and then to this equipment.
Various adapters for this purpose are available. (→ Table 1-2 Option List)

Table 10-3 Adaptability of Optical Fibers and Restrictions

Type of optical fiber		Adaptability			Maximum resolution	Absolute level accuracy
Type	Core diameter	Single	Double	Optical output		
SM	5	○	○	○	0.05	○
SM	9	○	○	○	0.05	○
SM	10	○	○	○	0.05	○
GI	50	○	○	○	0.1	△
GI	62.5	○	○	×	0.1	△
SI	50	○	×	×	0.2	△
SI	80	○	×	×	0.5	△
SI	100	○	×	×	0.5	△
SI	200	○	×	×	1.0	×
SI	400	○	×	×	2.0	×
SI	800	○	×	×	5.0	×

Note: The optical fiber to be connected to the [OPTICAL OUTPUT] connector (optical output) of the AQ-6315B is limited to GI50 µm

10.3.2 Restriction on double monochromator

When the monochromator is set to "double", the fiber usable for optical input is limited to an SM or GI.
At optical output, because the optical fiber used for output is GI 50 µm, the optical fiber usable for light input is limited to an SM or GI fiber with a less core diameter that it.

10.3.3 Restriction on resolution

The maximum resolution of this equipment is 0.05 nm, which is a value when the SM fiber is used.
In case a fiber with a larger core diameter is used, the maximum resolution is restricted as shown in Table 10-3.

Even if the resolution is set to a lower value than the table, the measurement level becomes inaccurate but the resolution is not improved.

In particular, when entering space light, it is advantageous to use a fiber with a larger core diameter but there is a restriction on resolution.

10.3.4 Absolute level accuracy

The absolute level of this equipment is calibrated by SM 10 µm fiber.
The level accuracy, when the other fibers are used, is out of specification.

As a matter of practical efficiency, any SM fiber other than the SM 10 µm fiber will provide an almost accurate level.

The GI fiber will provide a rather accurate level if the light source is of low coherence (low monochromatism) like white light, natural light and LED. In case of laser light which is of high monochromatism, interference occurs in the fiber and the intensity distribution of radiated light from the fiber end varies with fiber forms. Accordingly, when the fiber is moved, the measurement level may change.

Fibers with a large core diameter have a small monochromator NA values, so that only a part of the light output from the fiber cannot be measured and the measurement level becomes small.
However, the measurement level is accurate as an optical spectrum viewed relatively.

10.3.5 Effective range of level axis when the measuring sensitivity is set to NORMAL RANGE HOLD

When the measuring sensitivity is set to NORMAL RANGE HOLD or in the pulse light measurement mode, the gain of the internal amplifier is fixed. Accordingly, the effective range of measured data is limited into the range of the following expression specifying the set value of reference level as R (dBm).

R – 30 < (Effective range) < R + 10

When the level scale is set to 10 dB/DIV, the display exceeds the effective range, so that the 10 dB part from the upper end of the screen and the 30 dB part from the lower end become inaccurate.
For this reason, when the measuring sensitivity is set to NORMAL RANGE HOLD, the level scale should be used at 5 dB/DIV or less. If the setting exceeds 5 dB/DIV, a warning message is displayed and the data of the upper and lower parts of the screen cannot be displayed correctly
To display an accurate spectrum at 10 dB/DIV, set the measuring sensitivity to HIGH1 to 3.
When the measuring sensitivity is set to NORMAL RANGE AUTO, an approximate form of spectrum at 10 dB/DIV can be known quickly.

10.3.6 Stray light in the double monochromator mode

When the measuring sensitivity is set to NORMAL RANGE HOLD with the double monochromator, stray light with a 30 to 50 dB lower level than the intrinsic spectrum may appear at a position that is 200 to 300 nm away from the peak waveform. When the measuring sensitivity is set to HIGH1 to 3, this stray light does not appear

10.3.7 Step at 600 or 650 nm

As the AQ-6315A/B switches the diffraction order of grating (from the secondary optical source to the primary optical source) at 600 or 650 nm, a step may form on the measured waveforms.
This is because the effective resolution at 600 or 650 nm slightly differs between the primary and secondary optical sources. When an optical source having the wider bandwidth than that of the specified resolution is measured (an example of a white optical source), the difference of the effective resolution directly appears as the level difference.
However, if an optical source having the narrower bandwidth than that of the specified resolution is measured, the absolute level is measured correctly.

10.3.8 Ripple around 1380 nm

As the optical beam around 1380 nm is absorbed by a water (OH group) existing in the monochromator, a ripple may be formed on the measured waveforms.
The basic solution is the setup of wider resolution for ripple averaging.
Most of the measuring error can be eliminated if the resolution is set to 5 to 10 nm for LED measurement.

10.3.9 Wavelength sensitivity below 400 nm and above 1700 nm

As the wavelength sensitivity is not corrected in the range below 400 nm and above 1700 nm, the level display in these ranges may have an error from the absolute value.

Due to the temperature characteristics of the detector sensitivity, the measuring level may vary in the range above 1650 nm when the temperature changes.

10.3.10 Level accuracy below fiber cable cutoff wavelength (short wave length)

When a gas laser source or an LD optical source having the high coherence is measured, the level may become inaccurate due to the speckle pattern noise

If it has occurred, improve the coupling performance and the level accuracy will be improved

10.3.11 Optical axis adjustment during spectrum output (AQ-6315B)

When the spectrum output function is used, the optical axis position of emission light may be changed due to the polarization of incident light

Fine adjust the optical axis using the <BM ALIGN> key so that the emission light has the maximum power

Chapter 11 MAINTENANCE

This chapter describes the mechanical inspection and operation checks of this equipment.

Contents of Chapter 11

11.1 Mechanical Inspection 11-2

11.2 Operation Checks 11-2

- 11.2.1 Check when the power supply is turned on 11-2
- 11.2.2 Operation check for each switch 11-2
- 11.2.3 Wavelength accuracy check 11-2
- 11.2.4 Level accuracy check 11-4

11.1 Mechanical Inspection

Check the appearance and mechanical operations of the operating unit from the outside of this equipment.
For appearance inspection, visually check that are are neither damage nor deformation and also check if there is any looseness in switches, connectors and other assembly parts and if they can be operated smoothly.
If any abnormality is found, inform us of the details of it at once.

11.2 Operation Checks

11.2.1 Check when the power supply is turned on

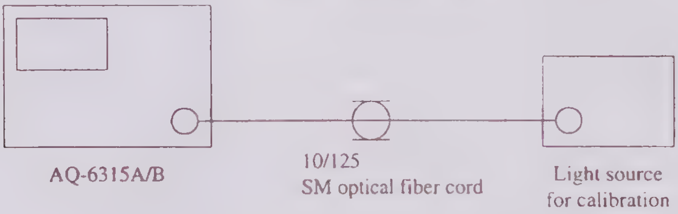
This equipment performs self-checks including monochromator operation check and internal memory check in the period from the initial screen till the ordinary display screen after the power supply is turned on
Usually, after the power supply is turned on, the initial screen is switched over to the ordinary display screen in one minute or so.
In case any abnormality is found, the initial screen is not switched over to the ordinary display screen after the lapse of several minutes and continuously displayed.
If any abnormality exists in the internal memory, an error message is displayed and the operation stops.
If any abnormality is found, inform us (head office, branch office or business office) of the details of it at once.

11.2.2 Operation check for each switch

Operate all of individual switches to check that this equipment can normally function.

11.2.3 Wavelength accuracy check

Make a wavelength accuracy check by the following measuring system.



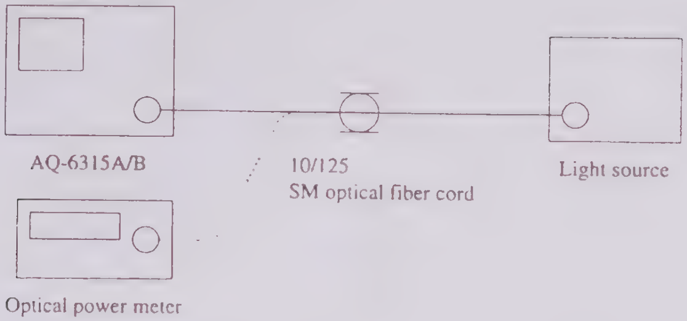
(1) Measure a light source for calibration such as gas laser whose wavelength is accurately known, by this equipment, and check that the peak wavelength of a displayed waveform matches the wavelength of the light source for calibration (within wavelength accuracy).
The wavelength accuracy of this equipment is ±0.5 nm (at 25 ± 5°C).

(2) If the wavelength error is large, perform wavelength calibration according to the following procedure.
Press the [SYSTEM] switch and select the soft key <WL CAL>.
In the soft key menu displayed by this operation, press the key with the same wavelength as the light source for calibration.
If any key with the same wavelength as the light source for calibration is not found, press a key with the nearest value.
Then, input the wavelength of the light source for calibration by the rotary knob, step keys or ten-key pad.
Next, press the soft key <EXECUTE>, and wavelength calibration is executed.
For details, refer to 5.1.14 [SYSTEM] switch.

(3) When the wavelength error exceeds ±5 nm and this makes wavelength calibration impossible, or when a wavelength error occurs on another wavelength after execution of wavelength calibration, the monochromator must be readjusted. Please contact us at that time.

11.2.4 Level accuracy check

Check the level accuracy by the following measuring system.

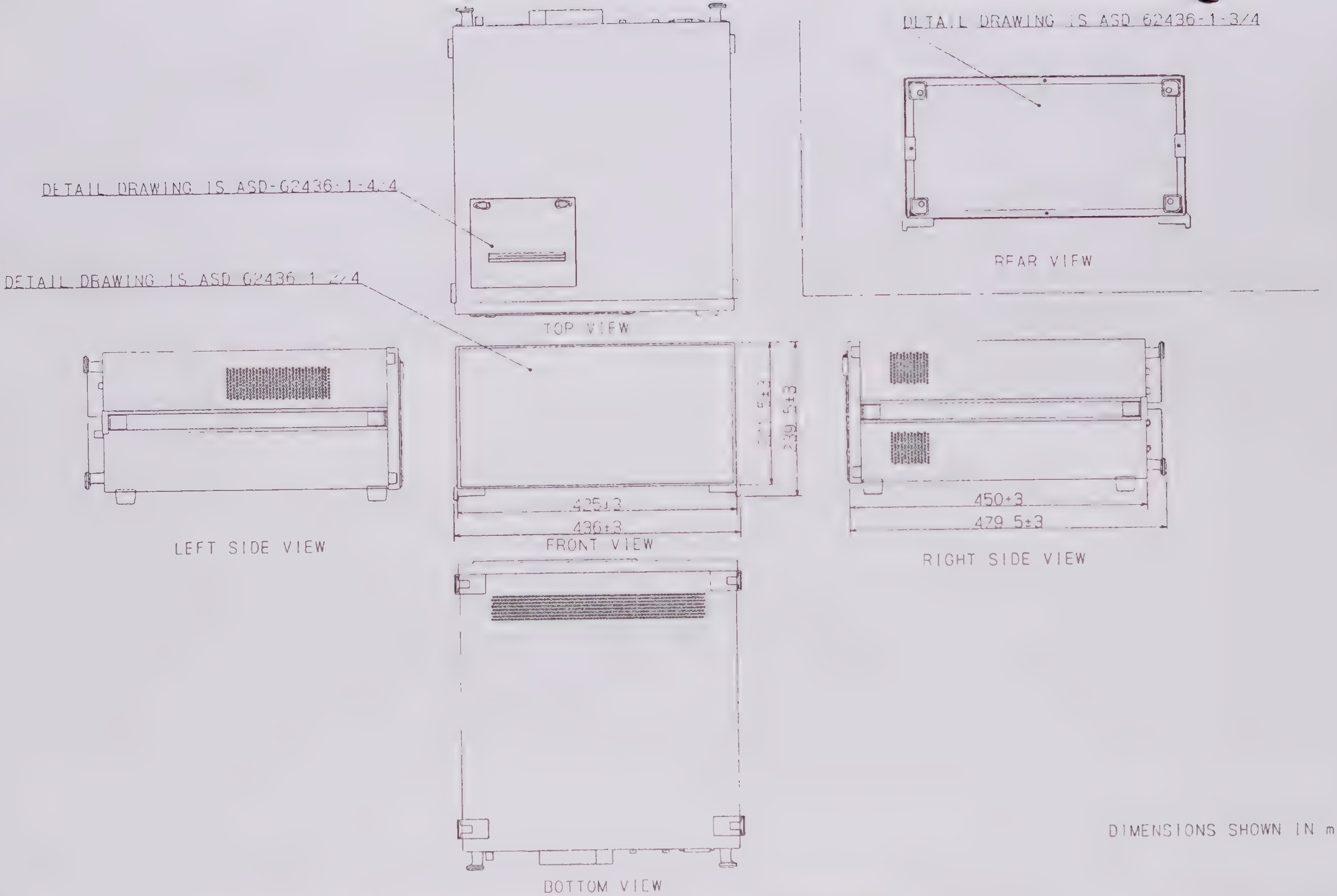


(1) As a light source, prepare one of the 3 light sources of 633, 1310 and 1550 nm.
However, the light source must be of thin spectrum (e.g., gas laser or DFB-LD) and permit putting all spectrums in the section of 10 nm.

(2) Connect the light source to this equipment and set the resolution of this equipment to 10 nm.
Execute measurement to obtain a peak level value.

(3) Disconnect the SM optical fiber cord from this equipment and connect it to the optical power meter
Execute measurement to obtain a power value

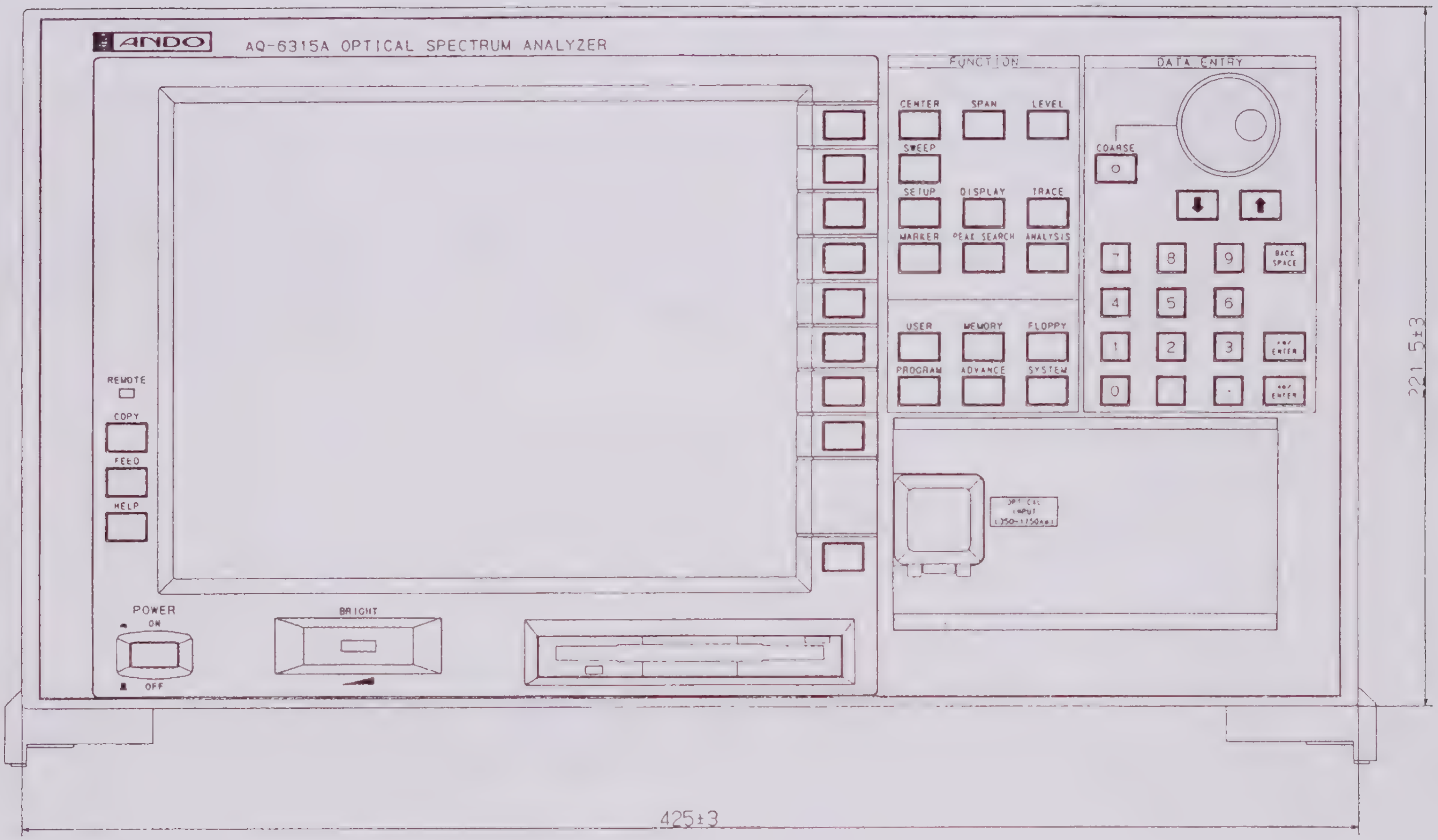
(4) Check that the peak level value obtained by this equipment agrees with the power value obtained by the optical power meter (within the level accuracy).
The level accuracy of this equipment is ±0.3 dB.


DETAIL DRAWING IS ASD 62436-1-3/4
DETAIL DRAWING IS ASD-62436-1-4/4
DETAIL DRAWING IS ASD 62436 1 2/4
TOP VIEW
REAR VIEW
LEFT SIDE VIEW
239.5±3
425±3
436±3
FRONT VIEW
450±3
479.5±3
RIGHT SIDE VIEW
BOTTOM VIEW

DIMENSIONS SHOWN IN mm

OUTSIDE VIEW OF AQ-6315A OPTICAL SPECTRUM ANALYZER

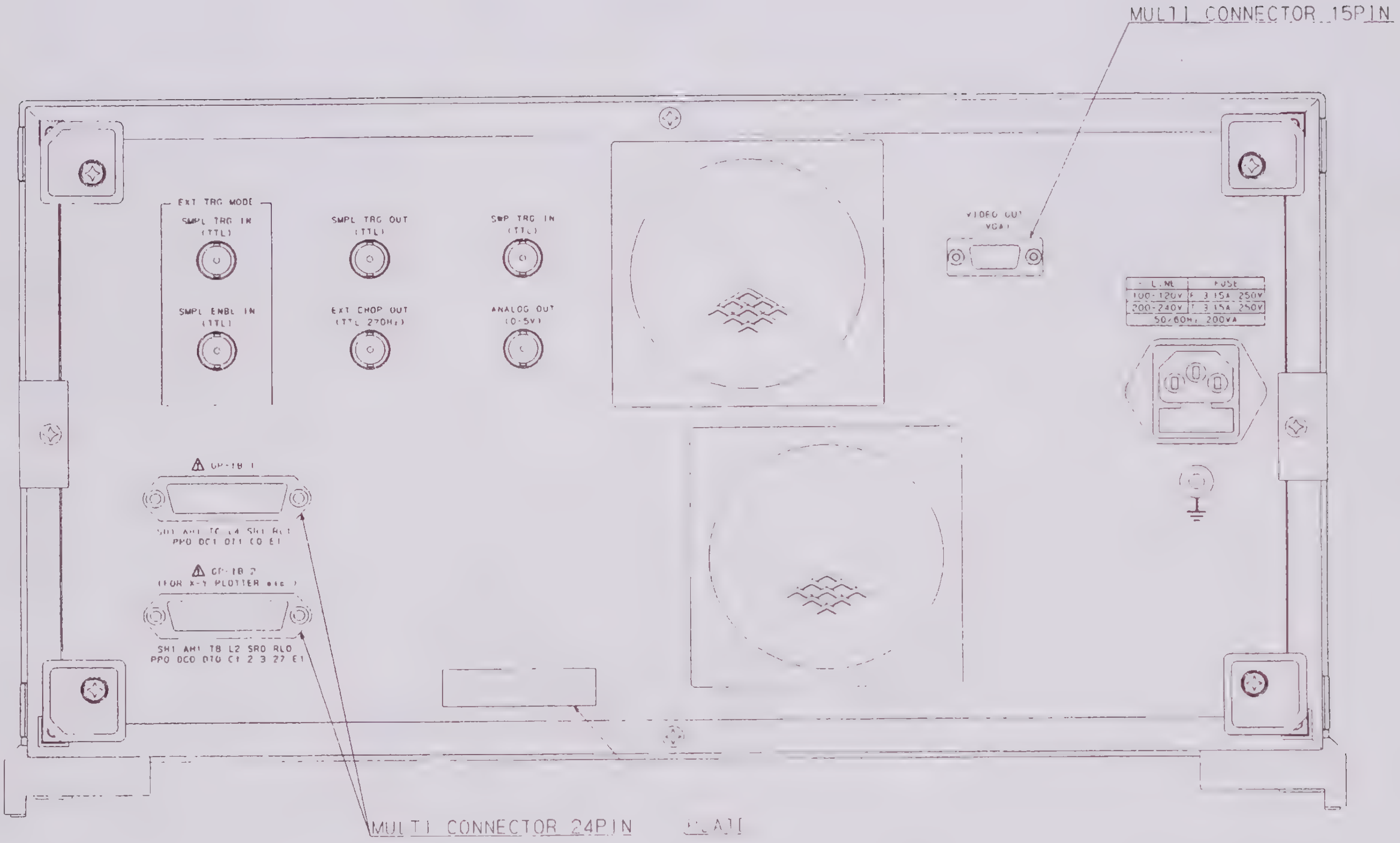
ASD-62436-1-1 4



DIMENSIONS SHOWN IN mm

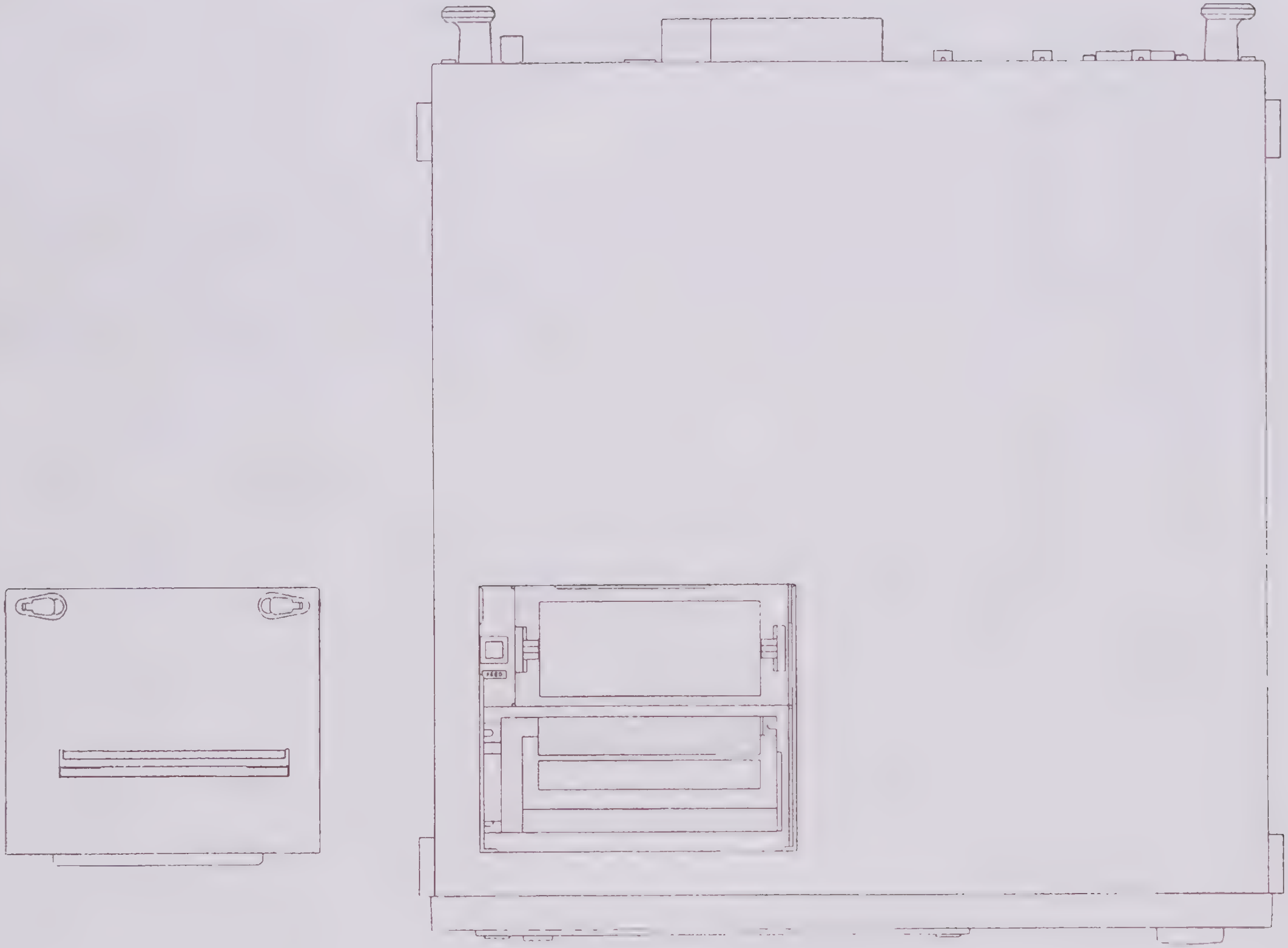
OUTSIDE VIEW OF AQ-6315A OPTICAL SPECTRUM ANALYZER
(FRONT)

ASD-62436-1-2/4



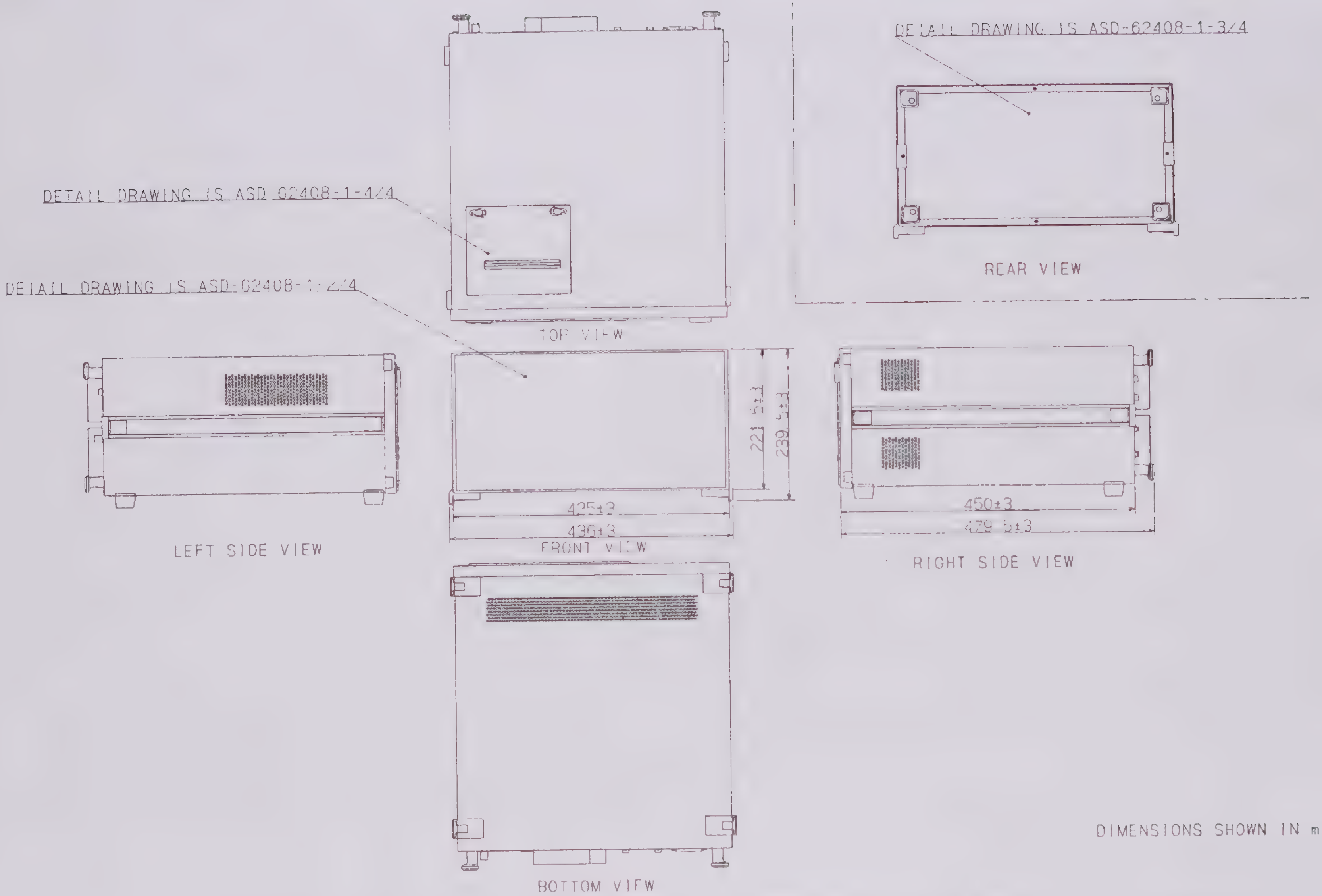
OUTSIDE VIEW OF AQ-6315A OPTICAL SPECTRUM ANALYZER
(REAR)

ASD-62436-1-3/4



OUTSIDE VIEW OF AQ-6315A OPTICAL SPECTRUM ANALYZER
(WHEN THE COVER IS OPENED)

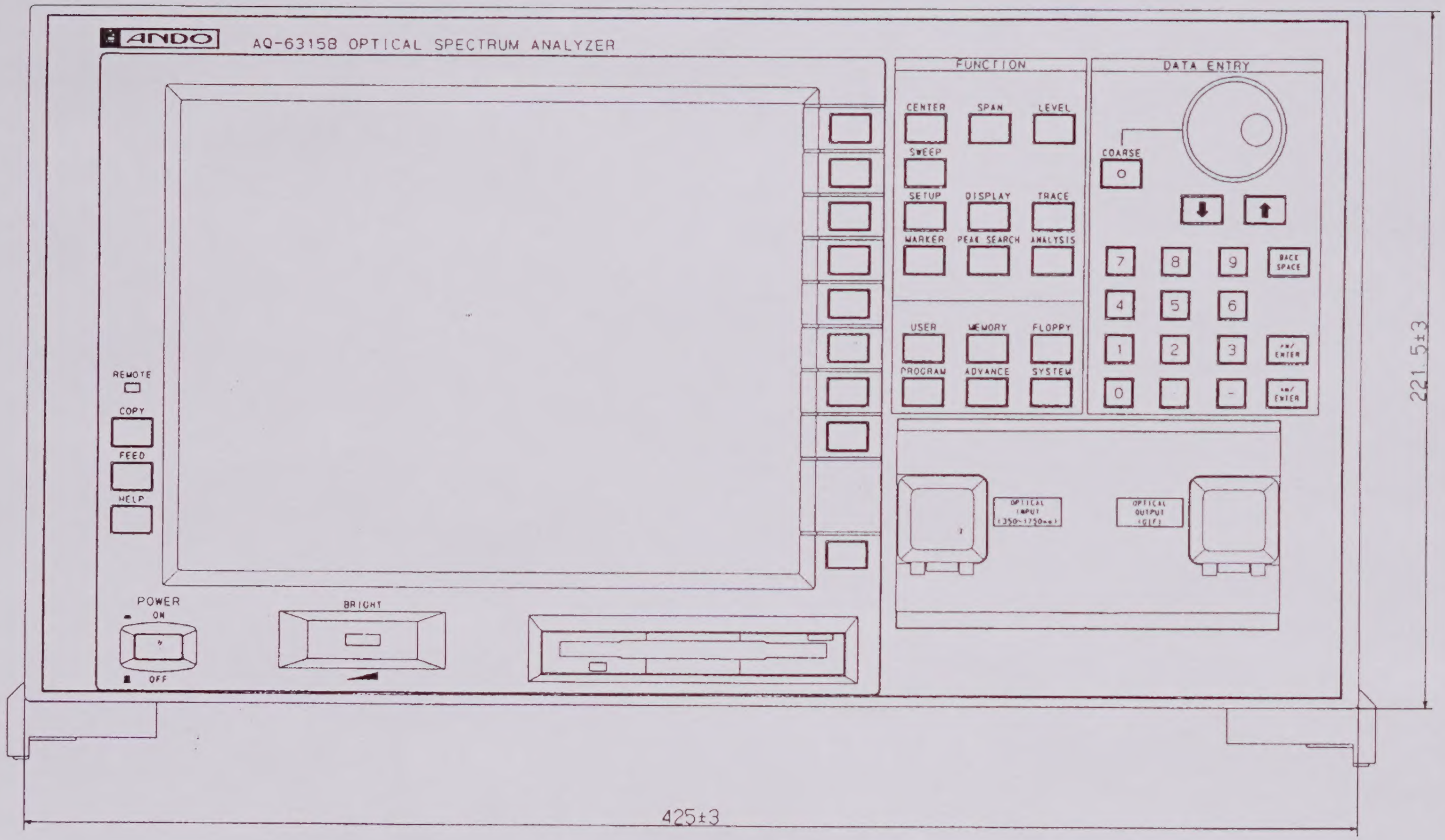
ASD 62436-1-4/4



DIMENSIONS SHOWN IN mm

OUTSIDE VIEW OF AQ-6315B OPTICAL SPECTRUM ANALYZER

ASD 62408 1-1/4



DIMENSIONS SHOWN IN mm

OUTSIDE VIEW OF AQ-6315B OPTICAL SPECTRUM ANALYZER
(FRONT)

ASD-62408-1-2/4

MP MASTER
MA32852